FOUNDRY

EST. 1902

TRADE JOURNAL

VOL. 103
No. 2255
Registered at the G.P.O. as a Newspaper

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

FEBRUARY 25, 1960
Offices: John Adam House, John Adam St., London, W.C.2

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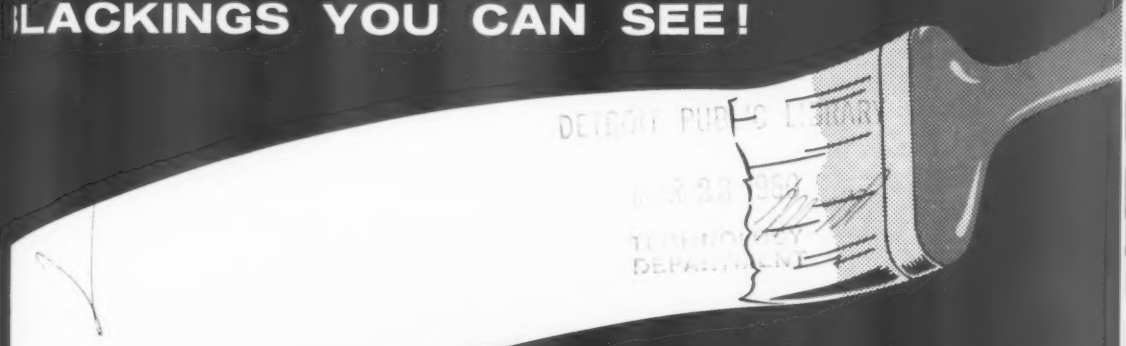
LACKINGS YOU CAN SEE!



TWO COMPLETELY NEW MOULD AND CORE DRESSINGS THAT CAN BE BRUSHED, SPRAYED OR DIPPED

TERRACOTE 40 (water-based)

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- Light grey in colour
- Unequalled suspension qualities
- Extremely economical
- No health hazard
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LEY'S ARE USING ROTO-CLONES* IN THEIR MECHANISED FOUNDRY

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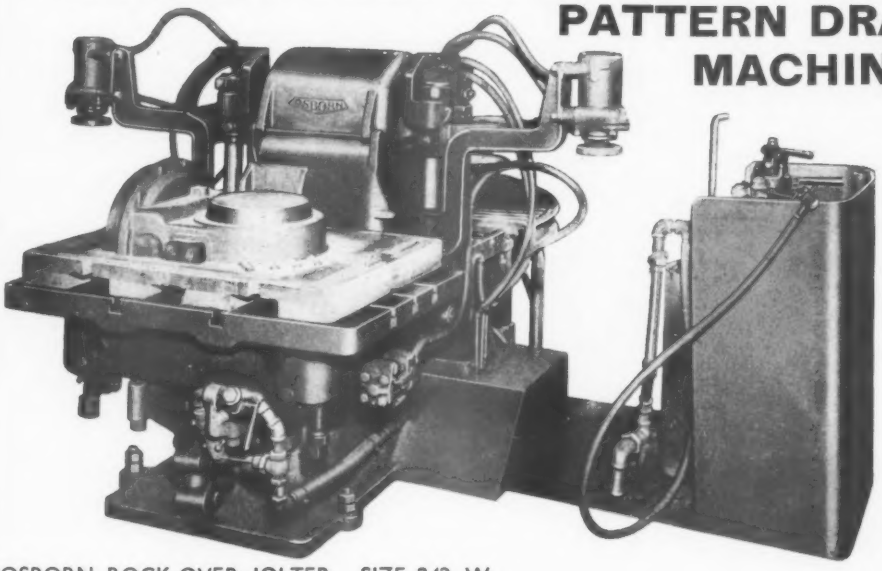
* *Registered Trade Mark. Made by Air Control Installations Ltd., under licence from American Air Filter Co. Inc.*

* *There are more Roto-Clones in service than any other wet-type dust collector.*

960

JACKMAN-BUILT
OSBORN JOLT ROCK-OVER PATTERN DRAW MACHINES



OSBORN ROCK-OVER JOLTER. SIZE 242. W.

	242 W. M/C	643 M/C
MAX. BOX DIMENSIONS OVERALL :—		
LENGTH	OPEN END	OPEN END
WIDTH	30″	38″
JOLT CAPACITY	1500 lbs.	2000 lbs.
TABLE SIZE	29″ × 42″	35″ × 50″
DRAW STROKE UP TO	19″	21″
COMBINED BOX SPACE & PATTERN DRAW	31″	33″

PNEUMATIC CLAMPS OPERATE IN TANDEM

OPEN ENDS PERMIT WIDE VARIATION OF BOX LENGTH

AIR CLAMPS LOCK LEVELLING MECHANISM WHICH TAKES CARE OF VARIATIONS IN BOTTOM BOARDS

AIR CONTROLLED PATTERN DRAW GIVES SLOW & FAST DRAW

CONVEYOR ROLLER ON LEVELLING MECHANISM CAN BE ARRANGEDS FOR ROLL-OUT EITHER ON CENTRE LINE OF MACHINE OR AT RIGHT ANGLES

'T' SLOTS ARE PROVIDED IN TABLE FOR QUICK PATTERN CHANGE

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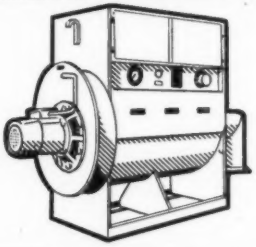
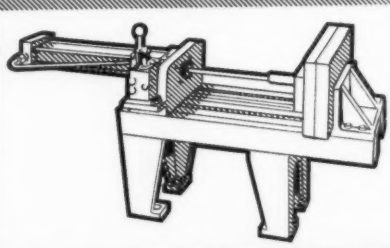
EFCO-BROWN BOVERI MOULD DRIERS

Portable electric mould driers to give quicker and more efficient drying by forcing hot air through the sand. Drying costs cut by 30%



GRAVITY DIE CASTING MACHINE

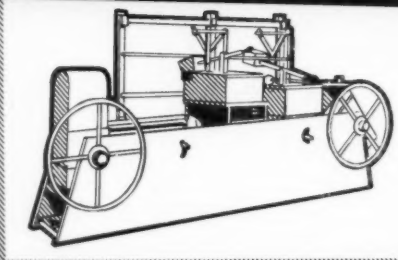
A simple machine for low cost production of castings which do not need to be made within strict dimensional tolerances. Dies cost 70%—75% less than orthodox dies.



..... Foundry Equipment

SHELL MOULDING MACHINE

A manually operated machine for making good moulds consistently in sizes up to 18 in. by 14 in. Power consumption is only 13 kW.



SHELL MOULD CLOSING MACHINE

A new-type patented press giving rapid, positive closing of shells using a thermo-setting adhesive. Closing time can be only 30 seconds with 100 moulds being closed an hour.

Enquiries invited for gas and oil fired melting furnaces, heat treatment furnaces, core blowers and all types of mould and core drying ovens.

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A new method of desulphurising iron and steel, developed in U.S.A. by Diamond Alkali Company. The desulphurising process is efficient and easily operated, using inexpensive re-agents. Reactors can be supplied for batch and continuous production, for outputs of 5 tons or more an hour.

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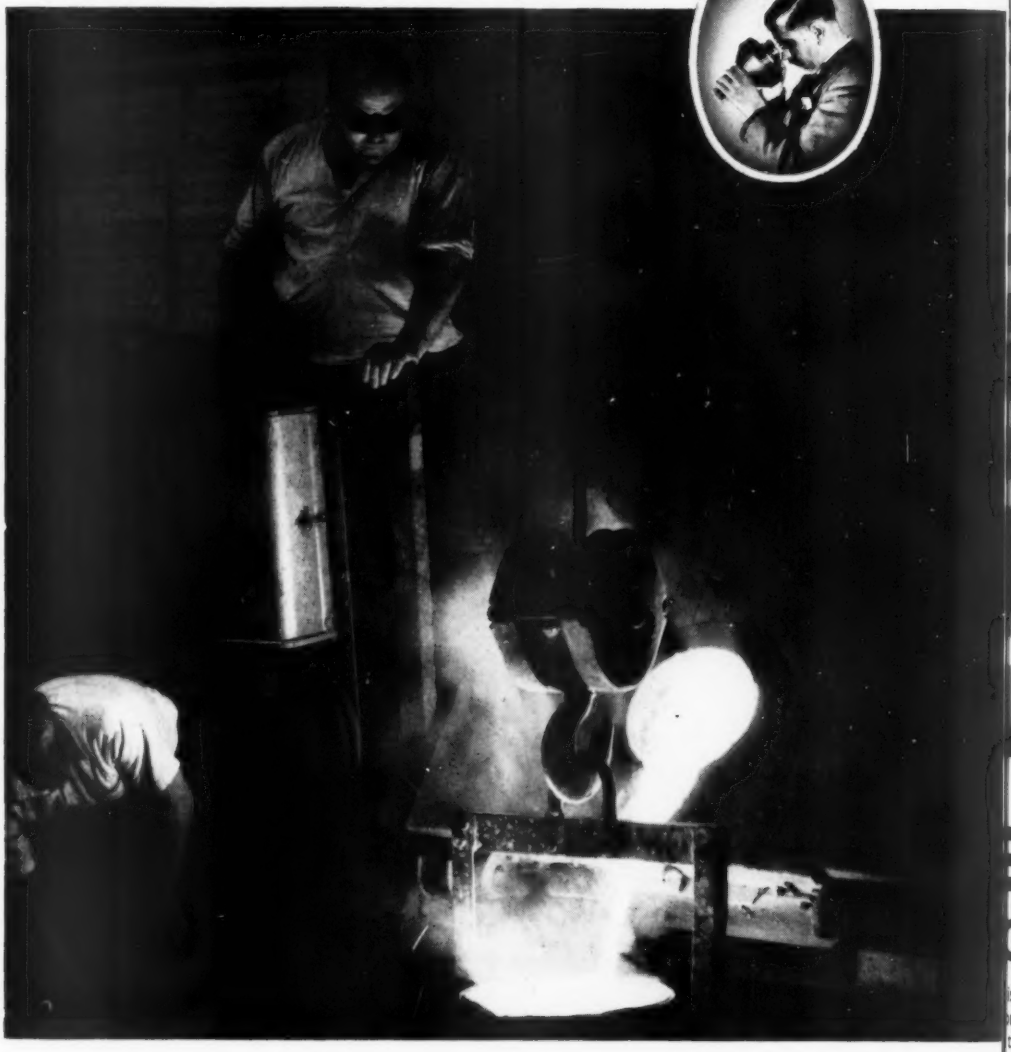
PYROMETERS AND THERMOCOUPLES



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give quick, accurate response (±0·1%) on bold indicator dial—record temperatures automatically—operate remote indicators if required—provide an extremely flexible and comprehensive measuring system—wide range of types available.

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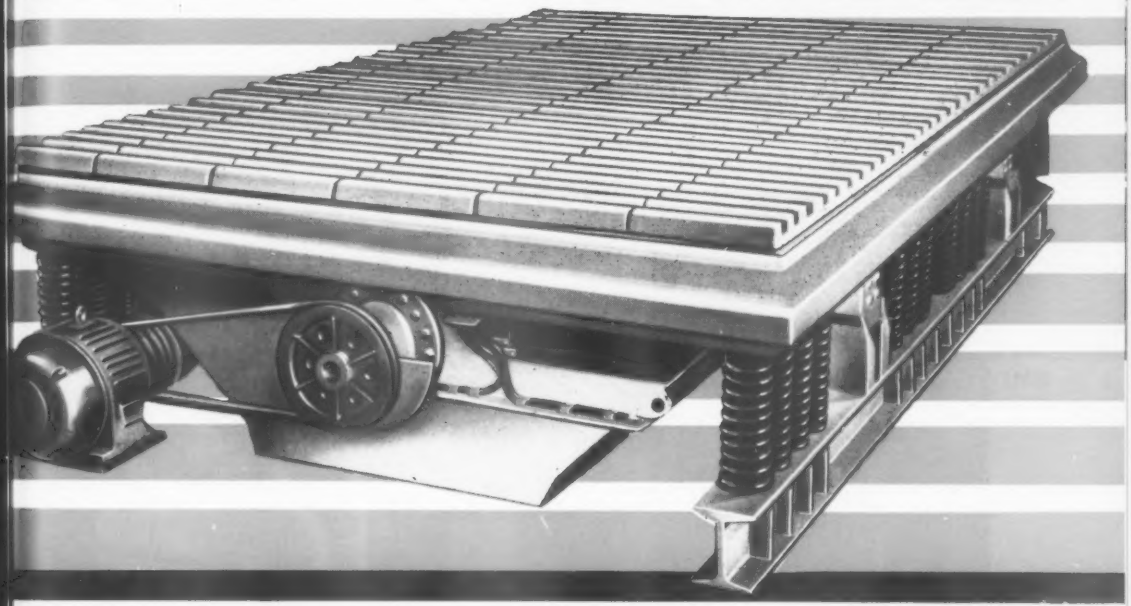

THE HEWITT-ROBINS FLOATEX FOUNDRY SHAKEOUTS

SELECTED FOR THE NEW MECHANISED FOUNDRY AT LEYS MALLEABLE CASTINGS CO. LTD., DERBY

s a distinguishing feature of FLOATEX Shakeouts that the vibrations, whilst fast and rough, are developed without shock. This has the double advantage of preventing damage the face of the moulding box, and also of being kind to the castings. Furthermore, the rations themselves are fully absorbed by supporting springs and are thus prevented from ching the foundations. Only simple foundations are therefore required. Sizes range m a single unit 2ft. by 2ft. up to a sextuple unit 17ft. by 34ft., capacity 150 tons. The size strated is a 12ft. by 10ft. duplex unit, capacity 45 tons. Floatex Shakeouts can be ineered into any existing Foundry Layout. Enquiries are invited.

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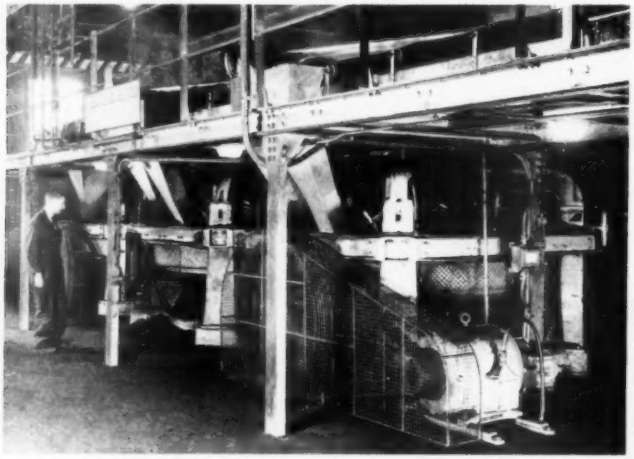
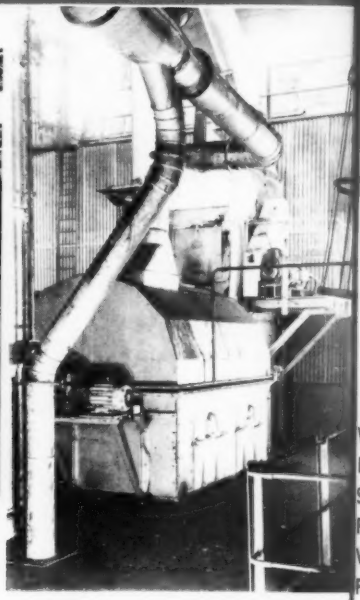
FOR THEIR NEW DERBY FOUNDRY



THREE S.B.3 SAND MILLS PROVIDE A CONTINUOUS SUPPLY OF MOULDING SAND (MAX. CAP. 30 T.P.H. EACH)



8'0" × 6'0" ROTARY SCRE ENSURES "CLEAN SAN FOR MILLS

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F. E. (NORTH AMERICA) LTD. Toronto, Canada

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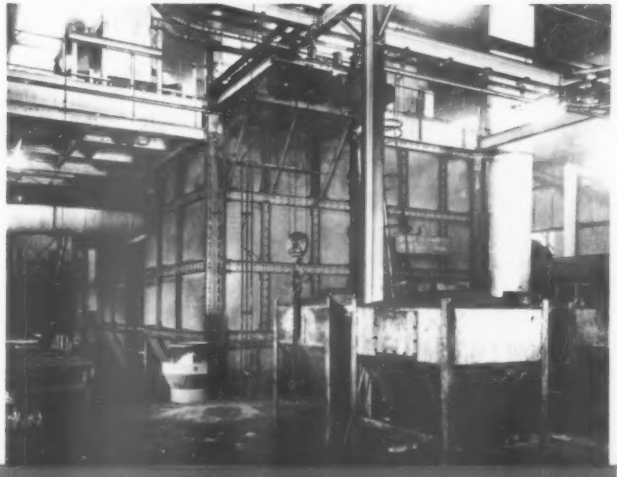
GENERAL VIEW OF SAND HANDLING AND DISTRIBUTION SYSTEM SHOWING TWIN OVERHEAD CONVEYORS FITTED WITH AUTOMATIC AND ELECTRONIC PLOUGH SYSTEM—ELIMINATING *"THE MAN OVERHEAD"*.



VIEW OF PART OF TWIN 125 TON CAPACITY SAND STORAGE HOPPERS EACH FITTED WITH FOUR 36" WIDE × 13'3" CENTRES FEEDER BELTS FOR CONTROLLED SAND FEED TO MILLS

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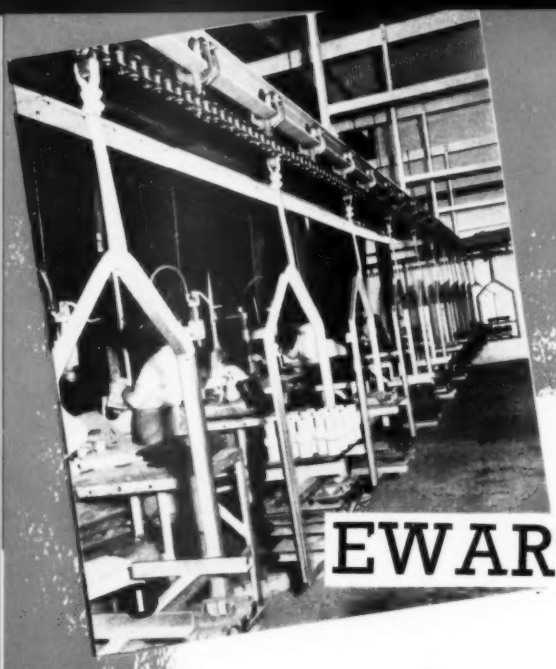
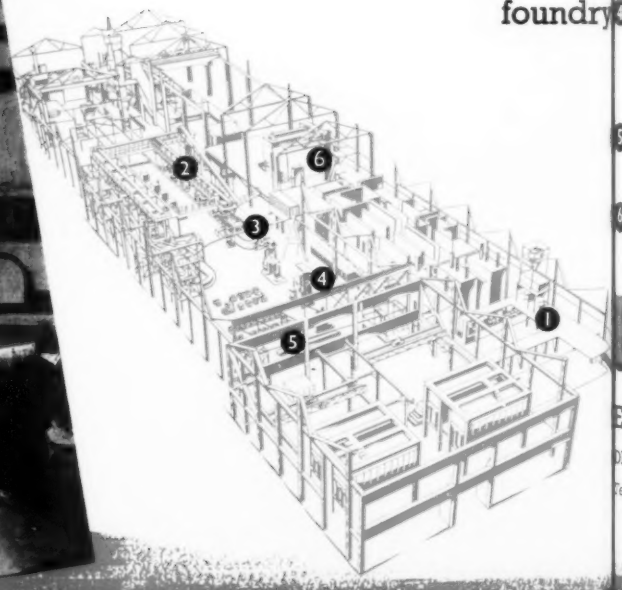


EWART'S CONVEYORS in LEY'S

The illustrations show some of the conveying plant designed and manufactured by Ewart Chainbelt Company for Ley's new highly-mechanized foundry



'S NEW FOUNDRY

1. A EWART No. C.188 monorail conveyor is employed for conveying the cores from the blowers to the drying stove and to return plates and driers from the oven to the coremakers.
2. Universal closed-circuit EWART pallet conveyor handling 18″ x 13″ moulding boxes for No. 1 moulding line. Approximate circuit 400-ft. The empty boxes are returned to the moulding machines by the EWART No. C.188 monorail conveyor fitted with special pendulum carriers.
3. A heavy duty universal EWART monorail conveyor 690-ft. circuit is used for cooling the castings after shake-out. Each bucket contains 8-cwt. of castings and is automatically fed by a EWART oscillating conveyor and automatically discharges into the spruing conveyor '4'.
4. A EWART torsion-mount oscillating conveyor 50-ft. long, on which the castings received in 8-cwt. batches from the monorail cooling conveyor are sprued. Residual sand is separated by a screen in the decking plate at the delivery end.
5. An unusual but economical application of a 24″ wide EWART P.V.C. belt conveyor which handles castings during fettling.
6. One of the EWART staggered bucket elevators handling 120 tons per hour of sand from the shake-out in the return sand system.

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Foundry Instrumentation

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HIGHER QUALITY CASTINGS

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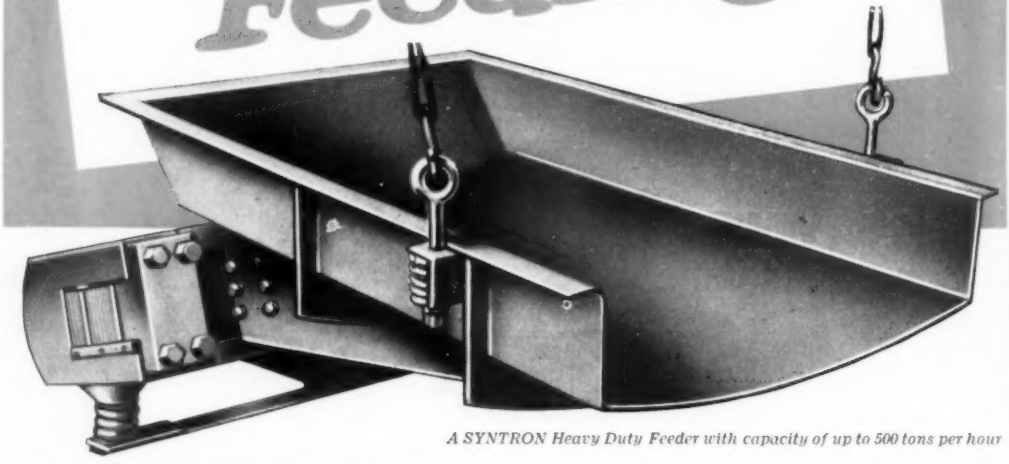
FOR Heavy Tonnage Feeding



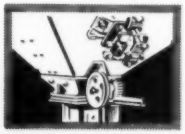
A SYNTRON Heavy Duty Feeder with capacity of up to 500 tons per hour

SYNTRON KEEPS THINGS MOVING

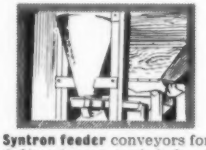
IN THE NEW FOUNDRY OF

Leys Malleable Casting Company Ltd

Syntron packers for settling products in drums and other bulk containers.



Syntron vibrators keep bins and hoppers clear with adjustable vibration.



Syntron feeder conveyors for delivering materials from hoppers.

Syntron trough feeders for use where materials must be conveyed over distances.

A full range of feeders is available to handle bulk materials, from a few pounds to hundreds of tons per hour.

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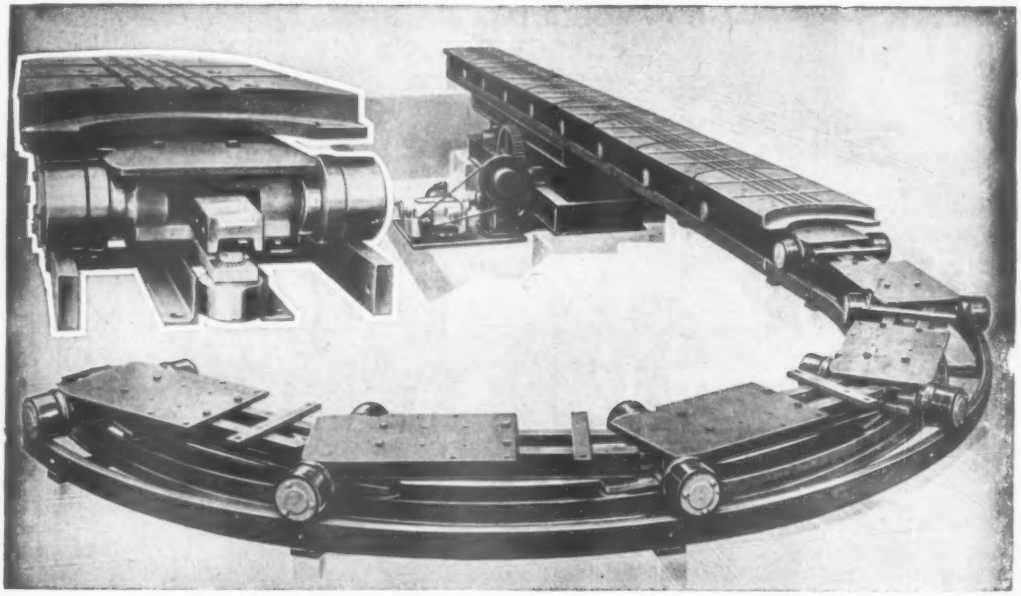
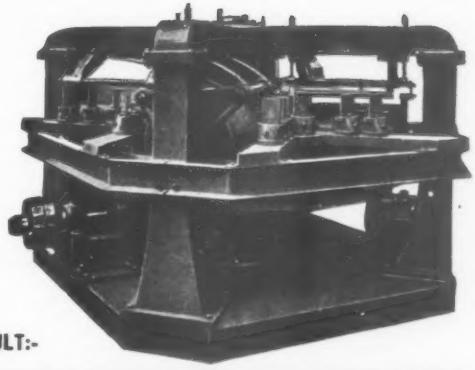
FOUMEC

MOULD CONVEYOR.

PLANTS



TYPICAL MOULD CONVEYOR SHOWING SOME C.I. PLATES REMOVED, ALSO DETAILS OF AXLES. SIZES TO REQUIREMENTS



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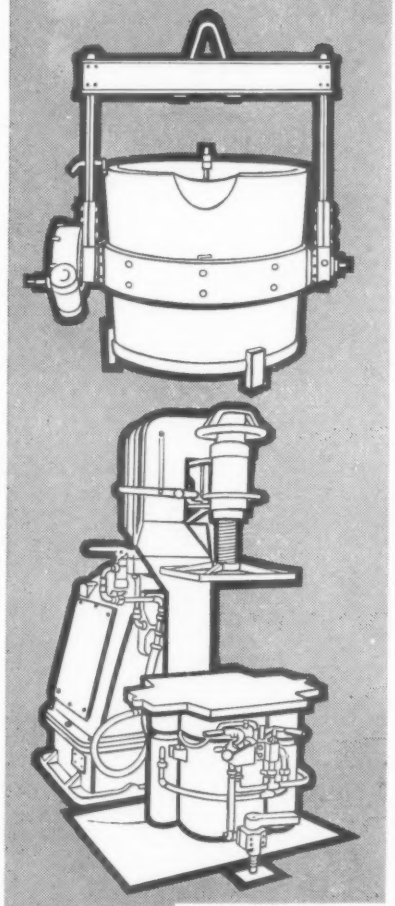
FOUNDRY PLANT



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B.M.M. Type At4 Turnover Moulding Machine, load 300 lb., pattern draw 9in., pattern table 30in. by 21in. Wallwork Type 562AY Turnover Moulding Machine, load 300 lb., pattern draw 1in., table size 22½ in. by 17½in.

Two B.M.M. Type RDO Jolt Squeeze Turnover Moulding Machine, load 300 lb.; pattern draw 12in.; pattern table 26in. by 18in.

B.M.M. Type AT1 Moulding Machines; load 300 lb.; pattern draw 6in.; pattern table 30in. by 21in.

Coleman Wallwork type CN Jolt Squeeze Ram Pattern Draw Moulding Machine, load 600 lb.; pattern draw 10in.; suitable for boxes 20in. by 20in. or 25in. by 12in.

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Conveyors for foundry use need heavy duty Components. Meco experience and a large range of heavy duty ball bearing rollers to choose from, mean that the right conveyor for the job can be supplied.
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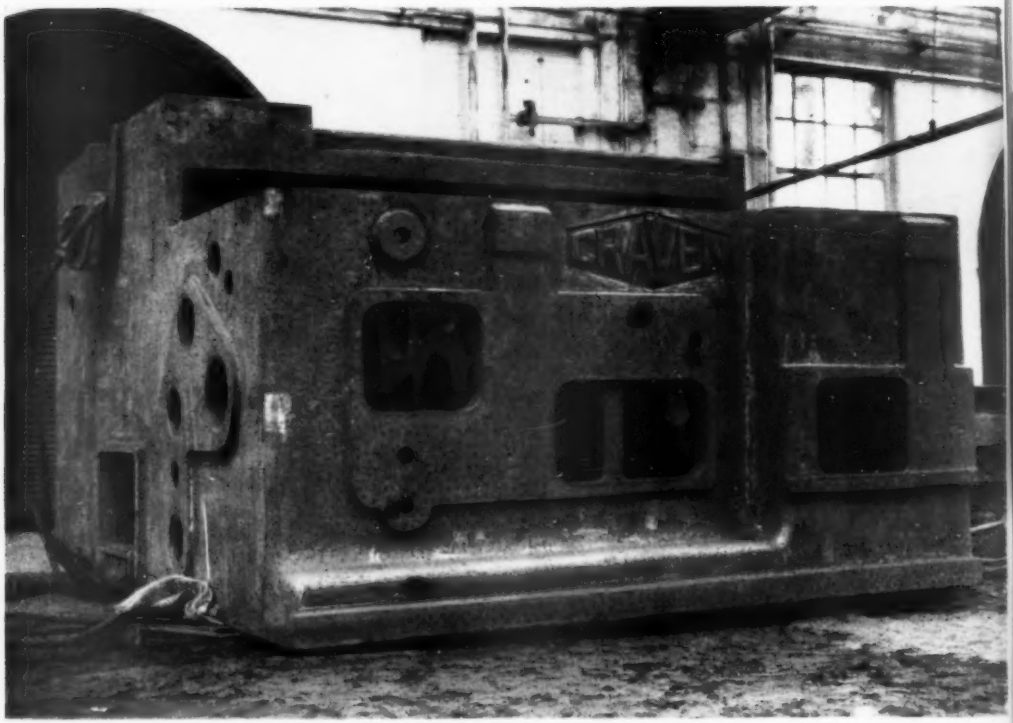

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TERRA FLAKE · COAL DUST · GANISTER AND
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John Smith Cranes give the slow speed control and fine setting vital in all foundry work. This feature can be included equally well on both A.C. and D.C. operated cranes

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Modern foundry practice calls for boxes able to withstand terrific stress and strain. Sterling boxes can be made to any degree of strength and do not of course crack or break like cast iron. Moreover they can be machined to fine limits on the outside for working against stops.

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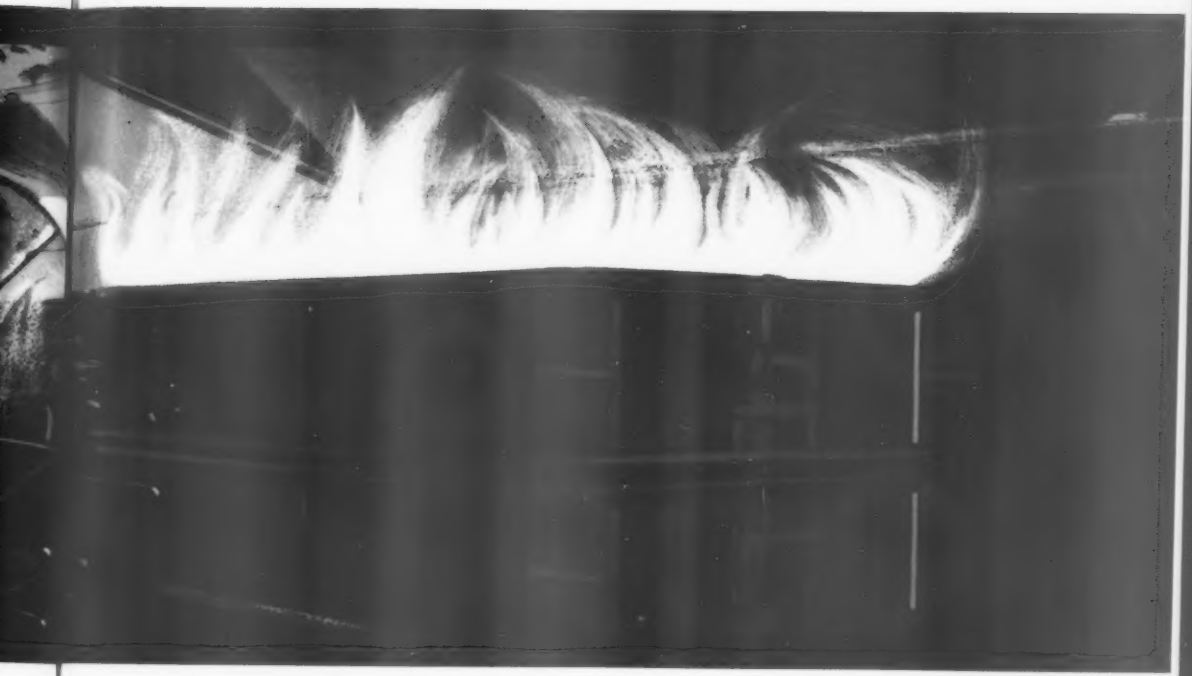
MOULDING BOXES

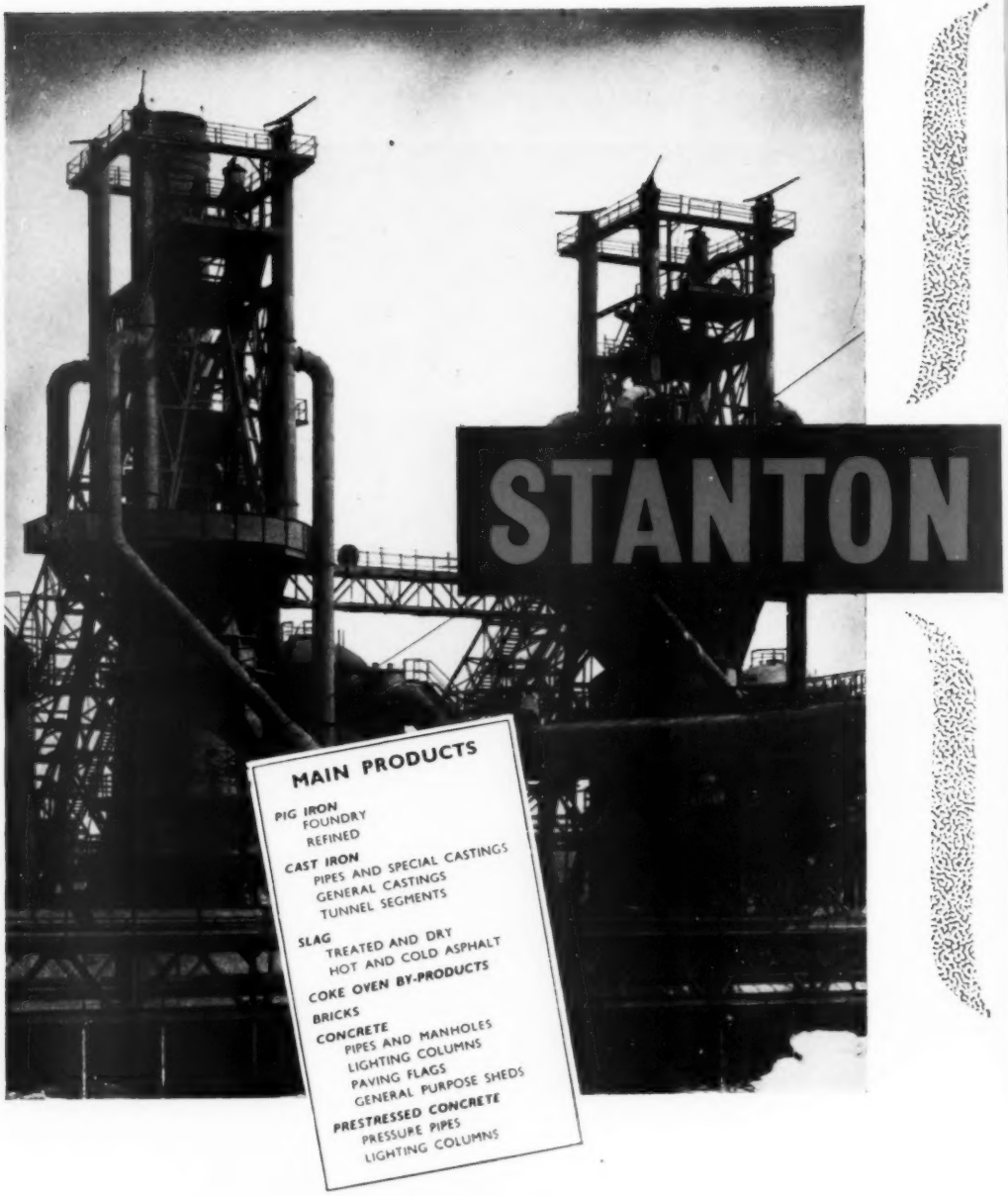
Long life in service, accuracy and assured interchangeability make Sterling the foundryman's first choice

STERLING FOUNDRY SPECIALTIES LIMITED

Sterling boxes stay on the job!



The box illustrated here is used in a foundry where mechanization has reached a very high standard of efficiency



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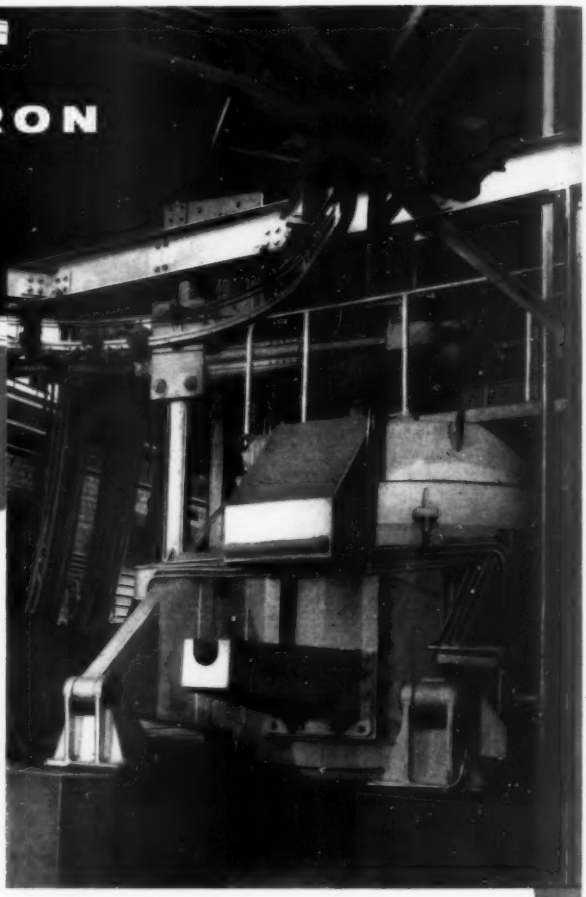

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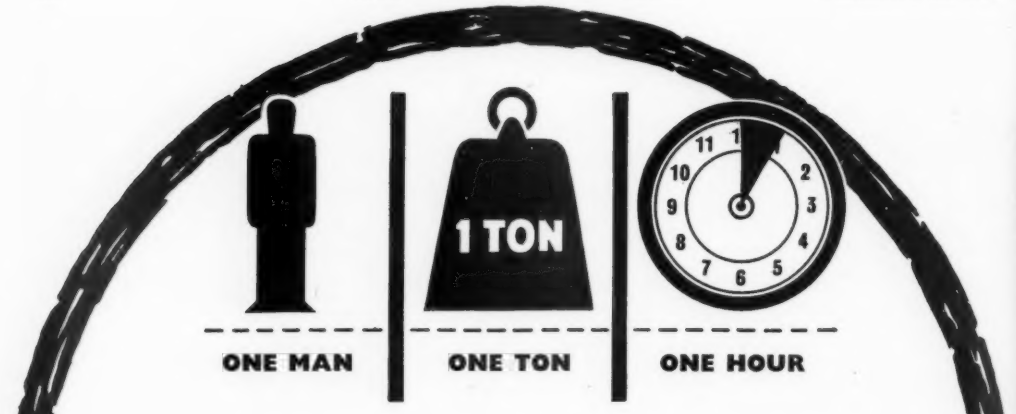

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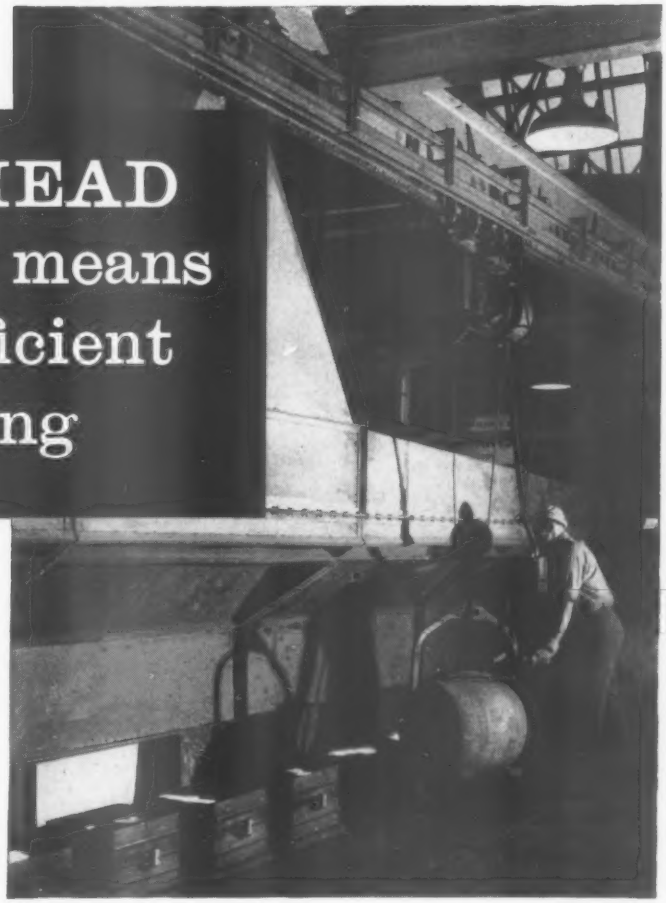

An overhead handling system from British MonoRail Limited means more economic, smoother pouring at the Derby foundry of The Leys Malleable Castings Company Limited. On the right an operator pours molten metal into moulds on a moving conveyor from a 500 lb ladle slung on a MonoRail track. The trolley and electric hoist on the track are moved by a power driven chain synchronised with the conveyor.

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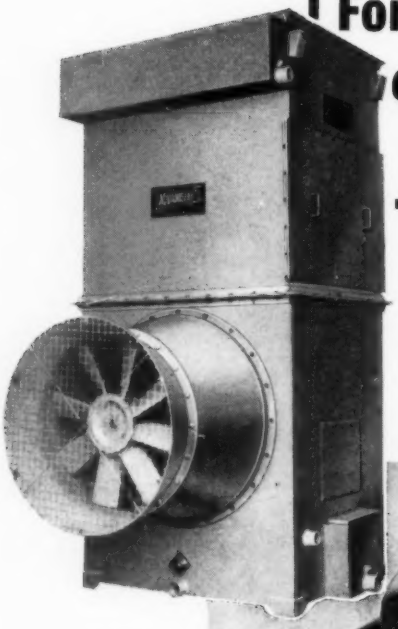

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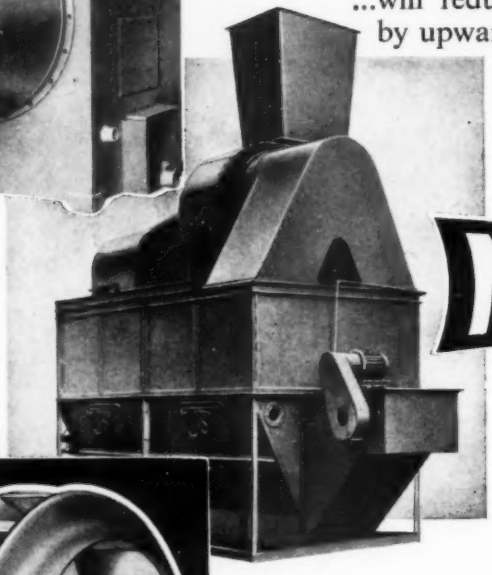

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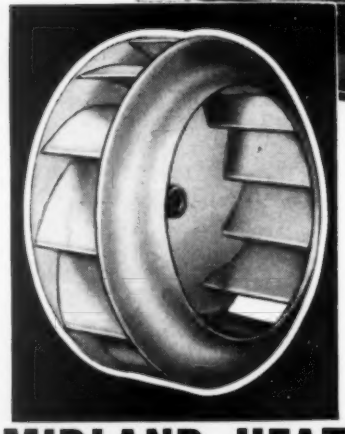

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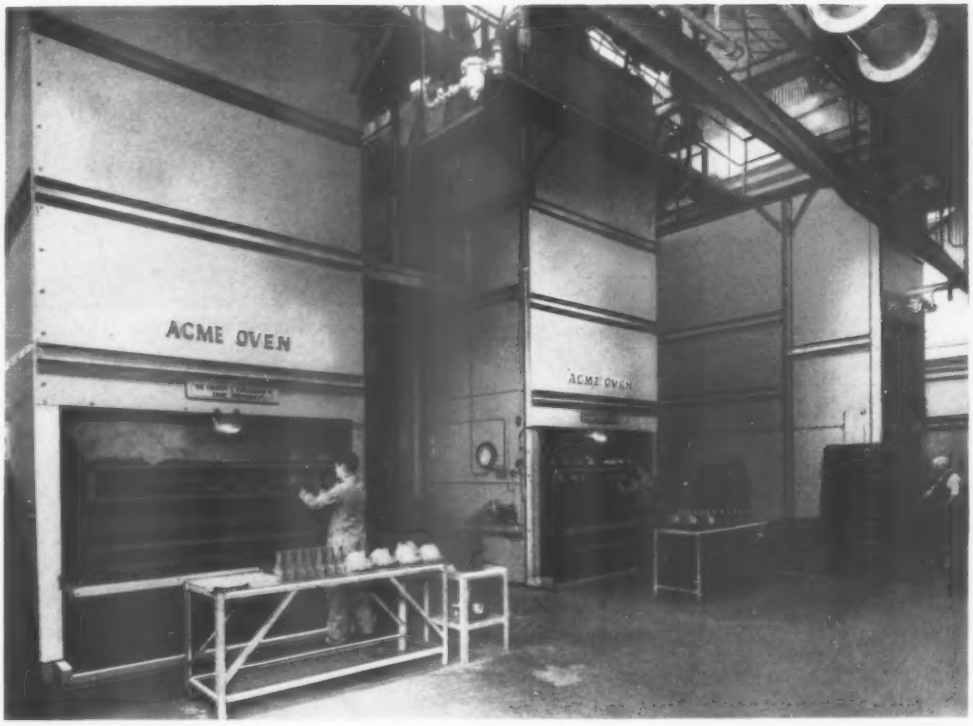

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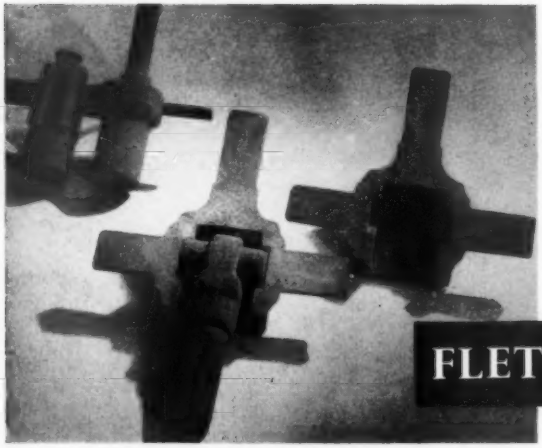

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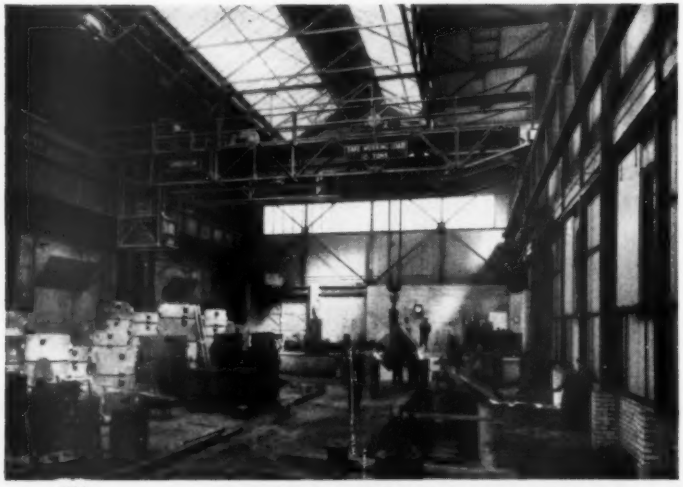

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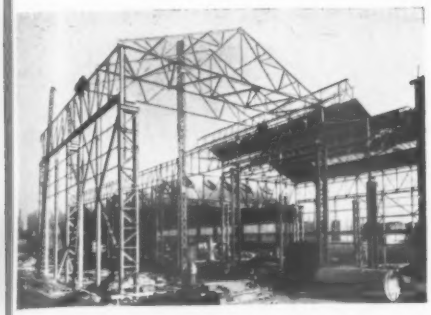

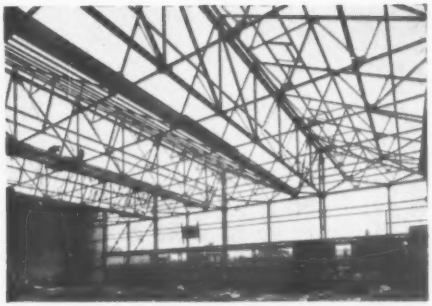

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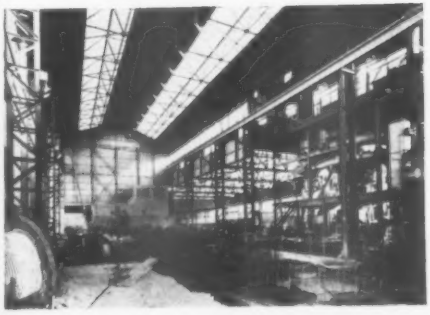

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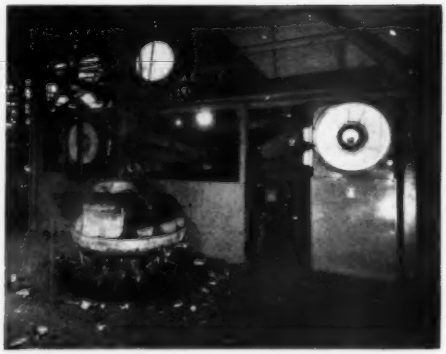

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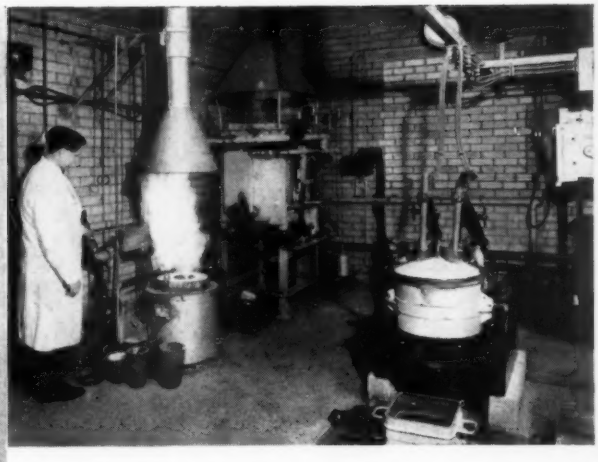

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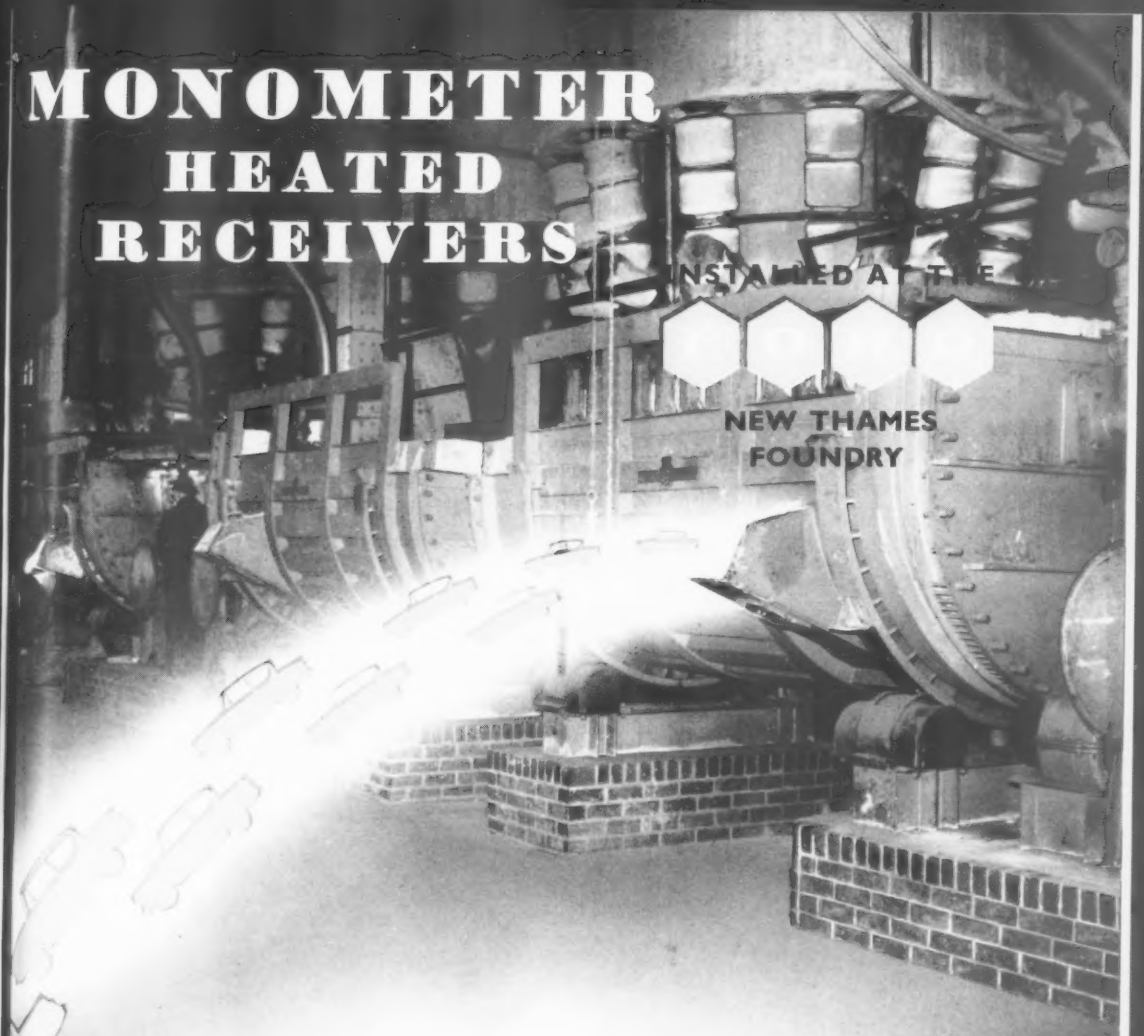

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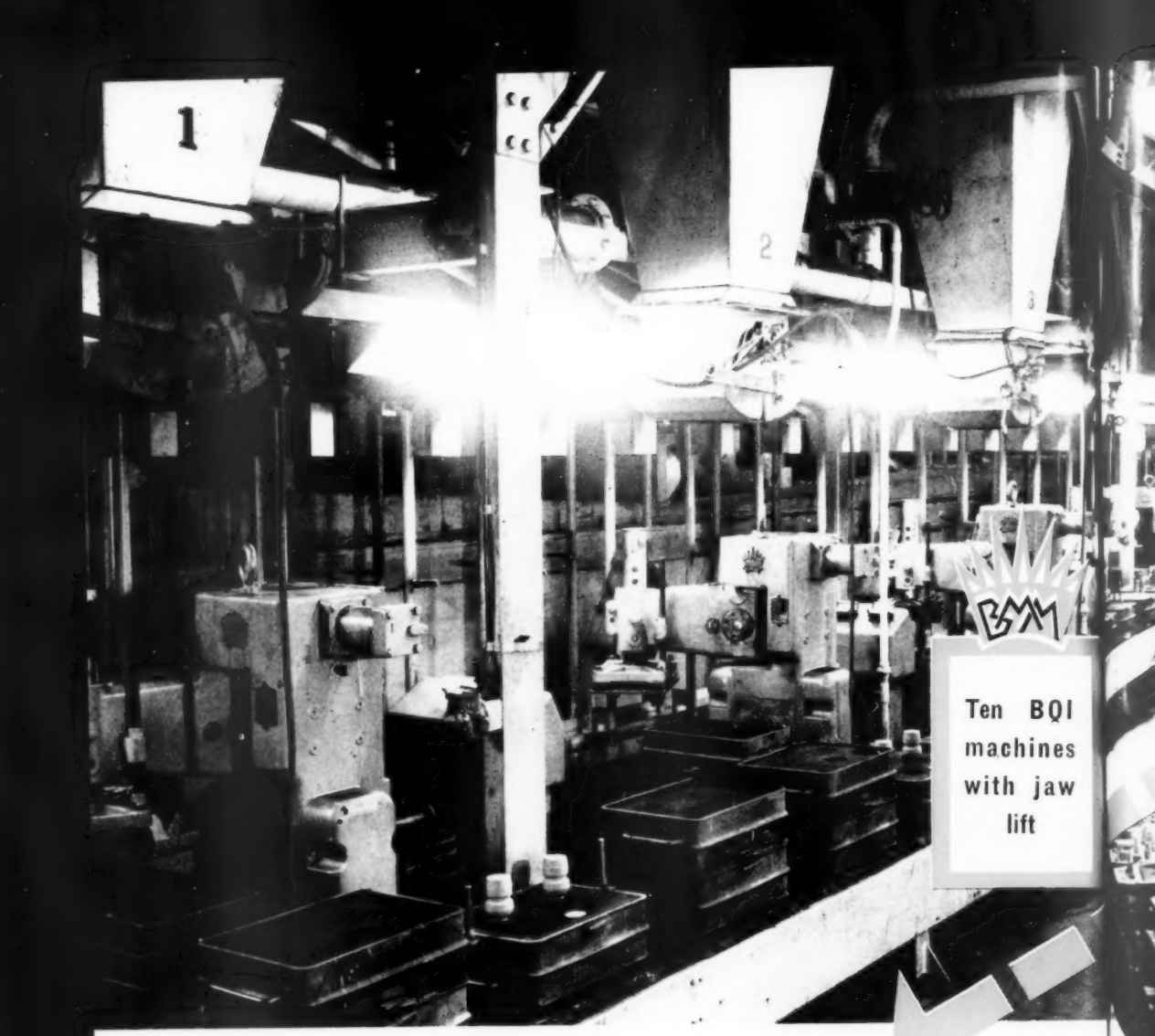

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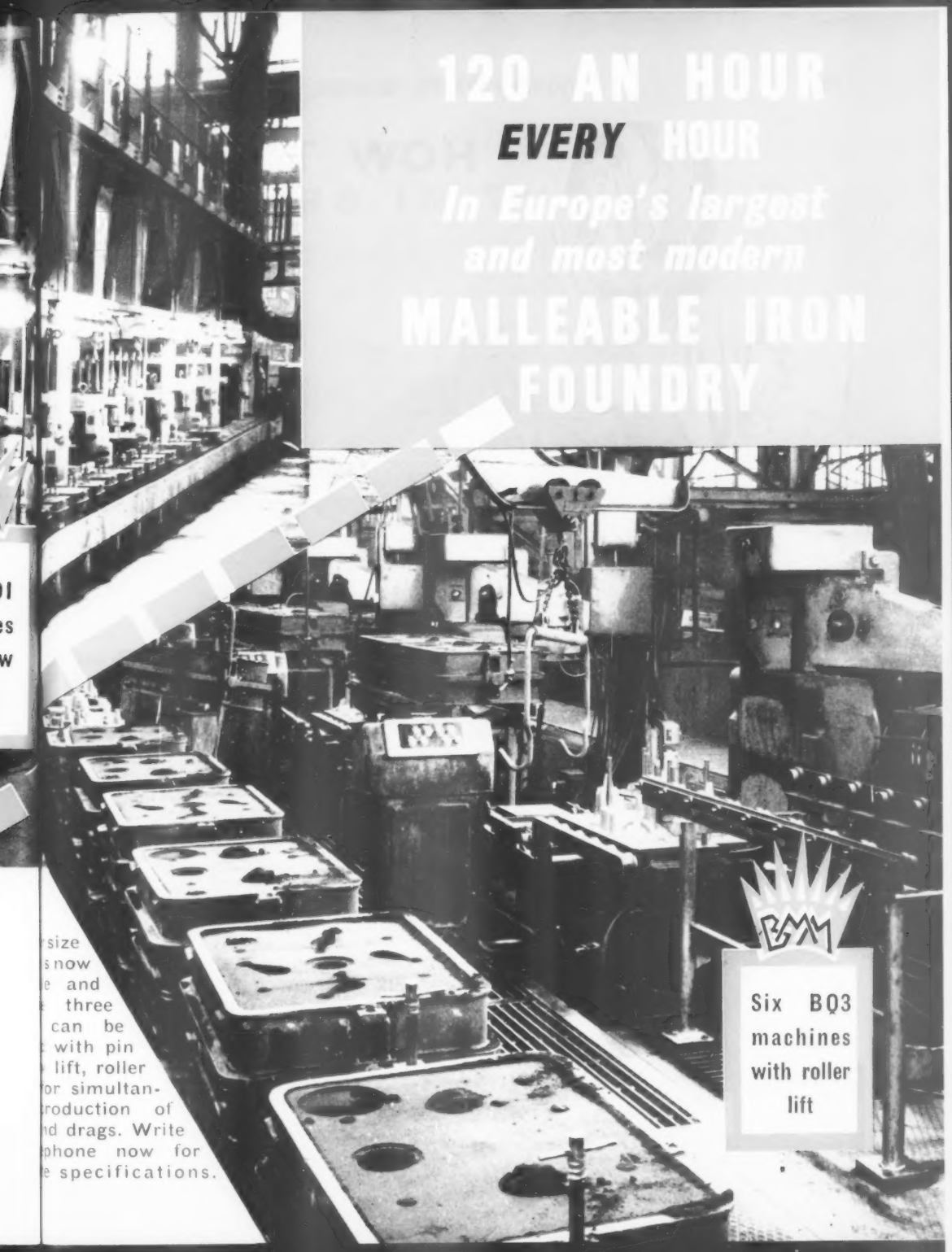

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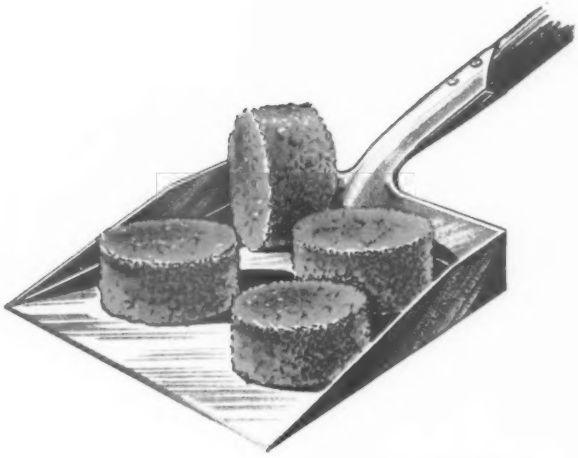

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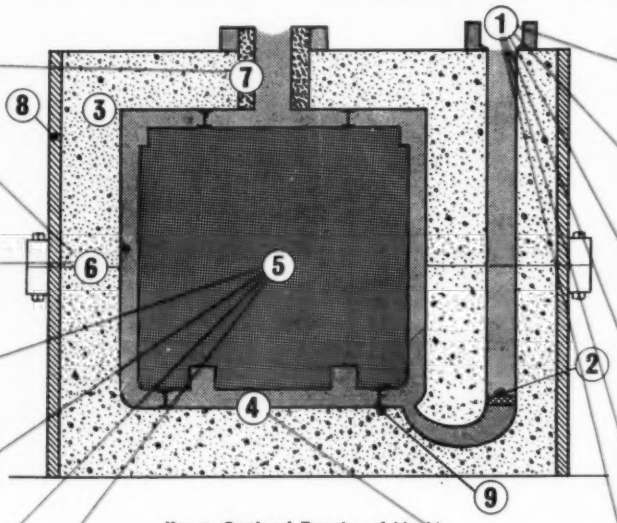

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F. BARRINGTON HOOPER, B.A.

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Publisher: H. J. DWYER

Circulation Manager: E. T. GRIFFITHS

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PRINCIPAL CONTENTS

PAGE

Mechanization with Flexibility

Detailed account of the new flow-production foundry of Ley's Malleable Castings Company, Limited, in Derby. In the whole scheme, particular emphasis has been placed on securing maximum flexibility of operation consistent with a high degree of mechanization. No effort was made to design a completely-automated plant. Instead, the foundry is intended to produce 250 tons per week of a very wide variety of casting sizes, with maximum productivity and minimum man/hours 221

Ironmasters and Merchants of the Nineteenth Century

By T. R. Harris

Excerpts from correspondence by founders of the last century gives an interesting insight into the problems associated with the manufacture of pig-iron in days gone by 241

Spark-hardening of Metals

By N. C. Welsh, B.Sc., Ph.D.

This abstract from a paper presented by Dr. Welsh at the Institute of Metals deals almost exclusively with the hardening of iron by carbon absorption 243

American Project for developing New Foundry Methods for High-duty Steel Castings 244

Mécanisation basée sur un Système souple. Compte-rendu détaillé sur la nouvelle fonderie à production continue de Ley's Malleable Castings Company, à Derby. Dans tout le projet, on s'est attaché à assurer un maximum de souplesse du fonctionnement, compatible avec un degré avancé de mécanisation. Aucun n'effort n'a été fourni dans la but d'établir une installation complètement automatique. Par contre, la fonderie a été créée dans le but de produire par semaine 255 tonnes avec une grande variété dans le taille des moulages, un maximum de production et un minimum d'heures de main d'oeuvre. 221

Les Maîtres-ferrants et les Marchands du dix-neuvième Siècle. Par T. R. Harris. Des extraits de la correspondence des fondeurs au siècle dernier, donnent un aperçu intéressant sur les problèmes associés à la fabrication de la fonte brute, autrefois. 241

Trempe à l'Etincelle des Métaux. Par N. C. Welsh, B.Sc., Ph.D. Cet extrait d'un article présenté par Dr. Welsh à l'Institute of Metals, est consacré presque exclusivement à la trempe de l'acier par absorption de carbone. 243

Projet Américain pour développer de nouvelles Methodes de Fonderie dans le but de produire des Moulages d'Acier de haute Qualité. 244

Anpassungsfähige Mechanisierung. Ein eingehender Bericht über die neue, für Fliessfertigung angelegte Giesserei der Ley's Malleable Castings Company Limited in Derby. Bei der Planung der Anlage wurde besonderes Gewicht darauf gelegt, grösstmögliche Anpassungsfähigkeit der Erzeugung zu sichern und trotzdem eine weitgehende Mechanisierung zu erreichen. Es wurde nicht angestrebt einen vollautomatischen Betrieb, sondern eine Giesserei für eine beabsichtigte wöchentliche Erzeugung von 255 Tonnen zu schaffen. Diese Erzeugung wird aus Abgüssen verschiedenster Grössen bestehen und mit grösstmöglicher Produktivität bei kleinstem Lohnstundenaufwand je Arbeiter durchgeführt werden. 221

Eisenbarone und Handelsherren des 19. Jahrhunderts. Von T. R. Harris. Auszüge aus dem Briefwechsel einiger Giessereiinhaber des letzten Jahrhunderts geben einen interessanten Einblick in die Probleme, welche in vergangenen Zeiten die Herstellung von Roheisen begleiteten. 241

Funkenhärtung von Metallen. Von N. C. Welsh, B.Sc., Ph.D. Dieser Auszug aus einem von Dr. Welsh vor dem Institute of Metals gehaltenen Vortrage befasst sich nahezu ausschliesslich mit der durch Kohlenstoffaufnahme verursachten Härtung von Eisen. 243

Ein amerikanischer Plan zur Entwicklung neuer Giessereimethoden für die Herstellung von hochwertigem Stahlguss. 244

Features, News, Commercial Information and Statistics

Leader: Ley's New Malleable Foundry 219
Autumn Metallurgical Week 220
CFA Health and Safety Conference 220
New Factory for Walmsley (Bury) Group 220
Forthcoming Events 220
Production Exhibition Conference 220
Law Cases 245
Mexico and Central American Buisiness 245
Lighting for Toolmakers 245
" Gas at Work " Exhibition 246
Equipment and Supplies 247
Raw Material Markets 256

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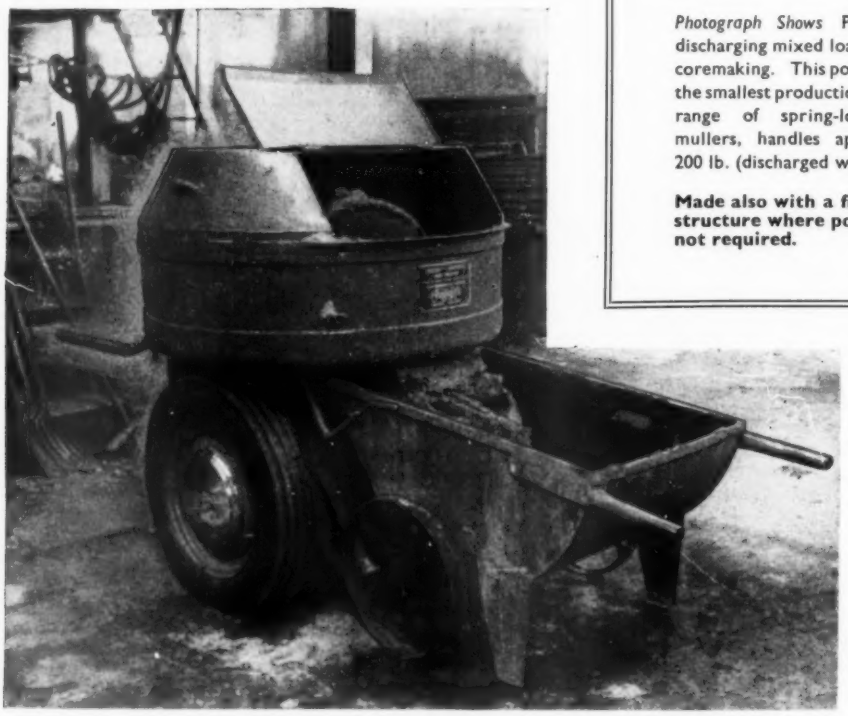

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J.J.M.

FOUNDRY
TRADE JOURNAL

Vol. 108 FEBRUARY 25, 1960 No. 2255

Ley's New Malleable Foundry

This issue carries an extensive account of a new malleable iron foundry installed in the Derby works of Ley's Malleable Castings Company, Limited. This old-established foundry—now the largest concern of its type in Europe—possesses a fund of knowledge on the making of malleable castings. We remember the old quarter-mile-long shop using pulverized-fuel-fired air furnaces regularly and economically turning out high-grade castings. Then, after the acquisition of Harrison & Company at Lincoln, a wholly-automatic foundry was installed there. For the most economical operation, this unit must confine itself to a limited range of castings. In the new project, for which a fresh building has been provided, emphasis has been placed on flexibility of output. This, moreover, has been effected whilst at the same time using mechanization to the maximum compatible with the basic principles.

It will be noticed in the account that a maximum amount of use has been made of instrumentation and it is a reasonable conjecture to ascribe much of the design and equipment of this new foundry to the data yielded by instruments over the years. Much intelligent use has been made of handling equipment for labour aiding at various points. This sort of information is not the type to be followed slavishly, but rather emulated, by foundries seeking to improve productivity. Ley's Malleable Castings Company, Limited, were fortunate in having good ground on which to build, because in the case of Ford's Thames Foundry, recently described in the JOURNAL, the nature of the waterlogged terrain influenced the ultimate design. At Derby, it has been found possible to institute flow production from the melting through all subsequent processes.

It is pleasing to see that, as in the case of the Thames Foundry, the equipment installed is 95 per cent. or more of British manufacture. This feature has a profound effect on overseas business, especially in the Dominions, where founders appreciate data on the reliability of British plant installed in foundries having an international reputation. We remember that but a few decades ago, British foundries were half full of foreign-made plant. That British-made foundry plant is now selling well in the USA—the birthplace of foundry mechanization—is indeed a high testimonial!

Autumn Metallurgical Week

An Autumn Metallurgical Week is being organized by the *Société Française de Métallurgie* to take place from Monday, October 17, to Friday, October 21, at the Maison de la Chimie, 28, rue Saint-Dominique, Paris 7. The theme of the symposium will be the heat-treatment of metal and alloys arranged under the following headings:—(1) Physico-chemical aspects of the transformations brought about by heat-treatment and their consequences. (2) Problems particularly concerning the treatment of various types of steel castings, (3) Application of treatments to new ferrous and non-ferrous alloys. (4) Treatment of large castings and forgings.

Metallurgists wishing to present a paper at the symposium are asked to make this known to the secretary of the *Société* at 25 rue de Clichy, Paris 9, before April 1, and then before July 1 to augment this with a résumé in duplicate, in either English, French or German, running to between 500 and 1,000 words. The final programme will be announced in September.

CFA Health and Safety Conference

The Council of Ironfoundry Associations' safety committee is organizing a Health and Safety Conference to take place at the Norbreck Hydro, Blackpool, from the evening of Wednesday, April 6, to mid-day on Friday, April 8. The programme will include papers on pneumoconiosis; ventilation and dust control; accident prevention in the smaller foundry; provision and use of personal protective equipment; the rôle of supervisors in industrial safety; first-aid arrangements for the foundry, and safe methods of manual lifting and handling. There will also be discussions, safety films, and a display of safety equipment.

The Conference fee is £3 10s. per person, and accommodation will be available at the Norbreck Hydro, the charge being, for a single room, with all meals, less gratuities, £5 per person. Provisional reservations addressed to the CFA secretary, 14, Pall Mall, London, S.W.1, may be made immediately.

New Factory for Walmsley (Bury) Group

A new £1,000,000 factory is being planned by the Walmsley (Bury) Group, Limited, the paper and board manufacturing machinery makers, on a site at Crompton Way, Bolton. The proposed factory will be a single-storey building between 50- and 60-ft. high.

First stage of the proposed development is a foundry of modern design and conception to produce a wide range of castings, especially those used in paper-making machinery, and including cylinders for machine glazing of paper, of up to 16-ft. dia. and 16-ft. 8-in. long. There will also be extensive workshops and storage equipment, where the larger castings will be processed and packed for shipment.

The Walmsley (Bury) Group, Limited, comprises the following companies: Walmsleys (Bury), Limited, Atlas Works, Bury; Bentley & Jackson, Limited, Lodge Bank Works, Bury; Ashworth & Parker, Limited, Riverside Works, Bury; Walker Brothers (Wigan), Limited, Pagefield Ironworks, Wigan; and John Wood & Sons, Limited, Barley Brook Foundry, Wigan.

The death has occurred at the age of 67 of Mr. NORMAN RYDER, for 30 years managing director of Ryder Brothers, Limited, Beehive Steel Foundry, Bolton, Lancs.

Forthcoming Events

FEBRUARY 26

Institute of British Foundrymen

Wales and Monmouth branch: Meeting at Llanelly Technical College at 7 p.m.

MARCH 2

Institute of Vitreous Enamellers

Southern section: Annual general meeting followed by "Some Fundamentals on the Preparation and Usage of Sheet-iron Ground-coat Enamels," by A. I. Blackburn, 7.15 p.m., at the Howard Hotel, Norfolk Street, London, W.C.2.

MARCH 3

Institute of Metals

London local section: "Patent Law," by C. E. Every, 6.30 p.m., at 17, Belgrave Square, London, S.W.1.

Institute of British Foundrymen

Stoke-on-Trent section: "Mechanization on a Modest Scale," by J. Bain, 7.30 p.m., in the Stipendiary Court Room, Hanley Town Hall.

MARCH 4

Institute of British Foundrymen

Beds & Herts section: "Men Only" dinner, 7 for 7.45 p.m., at the Wilbury Hotel, Letchworth.

Institute of Vitreous Enamellers

Midland section: Section dinner at the Station Hotel, Dudley. 7.15 for 7.30 p.m.

MARCH 7

Institute of British Foundrymen

Sheffield branch: "Bond Clays: Recent Work and Ideas," by A. L. Roberts, 7 p.m., at the Sheffield College of Commerce and Technology, Pond Street.

Production Exhibition Conference

The British Productivity Council is organizing a four-day conference to be held in conjunction with the Production Exhibition, Olympia, London, from April 25 to 29, 1960. With the theme of "Productivity—Men and Methods" the conference will consist of eight half-day sessions, the following subjects being dealt with:—Computers and Production Control; Fitting the Job to the Worker; Work-study and Industrial Engineering; Variety Reduction; Quality Control; Communications in Industry; Training of Supervisors, and Organizing for Cost Reduction.

Details are available from the Productivity Council at 21, Tothill Street, London, S.W.1.

Latest Foundry Statistics

Copper-base Castings: The output of copper-base castings in 1959 is stated by the British Bureau of Non-Ferrous Statistics to be 74,974 tons, which exceeds the 1958 production by 1,048 tons. The December production was 7,021 tons, which was well in advance of the average monthly figure for the year. This augers well for current production.

BECAUSE OF "burdensome changes" introduced into the proposed contract, the Phoenix Steel Corporation, of New York, has rejected the offer by the Metallurgical Equipment Export Company, Limited, London, S.W.1, to finance and build a new steel plant on the Delaware River, New Jersey.

ARBROATH TOWN COUNCIL has given planning permission for the erection of a factory for the Metal Box Company, Limited. The factory, which will cost £250,000 and will employ about 100 workers in the initial stages, will come into operation in January, 1961. Output target is over 1,000,000 cans a week.

Mechanization with Flexibility

Details of a new Flow-production Foundry at the Derby Works of Ley's Malleable Castings Company, Limited

Following the directors' decision that the production of the general run of malleable castings at Ley's foundries in Derby should be rationalized on a flow-production basis in entirely new buildings and plant, the firm's engineers in planning the new foundry were faced with the need to reconcile a high degree of mechanization with maximum flexibility of output. The new project was formulated entirely with these ends in mind and in distinct contrast to the completely "automated" foundry of the firm's associate company at Lincoln. In the account which follows, an attempt is made throughout to indicate not merely just what plant and equipment was chosen, but why particular designs and layouts were selected. It is hoped thus to provide a real contribution to world foundry technology instead of a mere catalogue of machinery. The whole scheme occupies a substantial proportion of an even larger programme of development aimed at placing these works—already the largest malleable foundry in Europe—second to none in productivity and adoption of highly efficient line-production methods.

The 1958 foundry of Ley's Malleable Castings Company, Limited, situate within the firm's main works' site at Colombo Street, Derby, has now settled down into full production, the few "teething" troubles have been eliminated, minor modifications carried through, and the project can thus be assessed *in toto* as a productive unit. The foundry was designed on single-shift operation, for an output of 250 tons per week of a fairly wide range of malleable-iron castings. A major objective was, of course, greater productivity per man/hour, together with economy of production and concentration in available floor-space. This goal has already been achieved and current demand for the company's products is such that double-shift operation is now being considered. It says much for the original design and equipment that such a virtual doubling of output can be viewed with equanimity and optimism.

As part of the company's comprehensive plan of works' rearrangement, the new foundry was sited in relation to other buildings as shown in Fig. 1. It will be seen that straight-line production is envisaged for this section of the works, which takes in raw-material arrival and stocking, melting, moulding and coremaking, fettling and dressing, annealing, post-treatment of castings and, ultimately, inspection and despatch. For the present, the project has gone as far as the annealing section where, at the time of writing, continuous units are being installed. This account, however, will stop at the conclusion of the foundry processes, leaving annealing and post heat-treatment operations to the future. The new foundry is practically self-contained for melting, moulding and coremaking, trimming and inspection (of the white-iron castings), up to annealing. Thus, the account here will record, particularly, full details of the raw-materials stockyard, cupola/electric-furnace duplexing of metal, pouring, the two moulding lines and ancillary foundry operations.

Preliminary Work

Preliminary work on the project involved a considerable amount of clearing of obsolete buildings and levelling of the site, overhaul of drainage and so on. In total, the area covered by the new foundry amounts to 400,000 sq. ft. Another preliminary considered essential before any installation of machinery commenced was the building of the model shown in Fig. 2 (scale $\frac{1}{4}$-in. to 1-ft.). This model, complete in every detail, was constructed in Ley's own patternshop and can be viewed in conjunction with the line plan of the layout of the new foundry (Fig. 3) in order to get a good conception of the magnitude and complexity of the scheme. All the new buildings with the exception of the sand laboratory and welfare block are on the ground floor, although, of course, concrete basements have been constructed for sand spillage, knock-out sand return, etc.

One of the major virtues incorporated in the plant is that it can produce a large proportion of the malleable castings required by the company. This was expressly purposed in direct contrast with the firm's associate foundry of Harrison & Company, Lincoln, which uses fully-automatic machines for producing a very limited range of designs and weights of castings.

Elsewhere in the Colombo Street works (see Fig. 1), Ley's have a relatively-new foundry with an all-electric melting plant for malleable. Although this will not be described in this account, it was in fact used as a "guinea-pig" for some of the planning embodied in the new foundry. Casting first commenced in the new plant in January, 1959, but the final stages of installation of ventilation equipment have only just been finished. This is because equipment for this purpose was designed on the job and installation delayed to take into account possible modifications of plant as experience was gained—a particular

example being the final development of automatic knocking-out and its dust-exhausting system. All the engineering work embodied in the new foundry was carried out by Ley's own staff.

MELTING

Considering the plan view of the new foundry (Fig. 3), it will be noted that melting takes place at one end of the roughly rectangular-shaped area, with the stockyard alongside. Adjacent to this is the moulding and pouring section with its service sections—for sand and core supply—alongside. Beyond these, continuing the straight-line sequence, come the dressing operations and then castings pass to annealing. Storage is provided in the stock-yard for coke (1,300 sq. ft.), foundry returns (100 sq. ft.), steel scrap (2,600 sq. ft.), and pig-iron (450 sq. ft.), the stocks reaching to a nominal height of 12 ft. (see Fig. 4).

Melting itself is a duplex operation, embodying recuperative hot-blast, water-cooled cupolas and one 12-ton electric-arc furnace. Two identical cupolas are provided, at present used on alternate days, each being of 11-tons per hr. nominal capacity. The cupolas themselves follow the now fairly orthodox layout for such units, of which details are shown in Fig. 5, which also indicates the path of hot- and cold-blast, cooling water, etc. A continuous-tapping and slagging box is incorporated of the Freier-Grunder type and a slag-granulation plant is installed, together with the necessary de-watering and disposal unit—the final product being dumped by fork-lift truck. Water from the slag-granulation plant runs to waste.

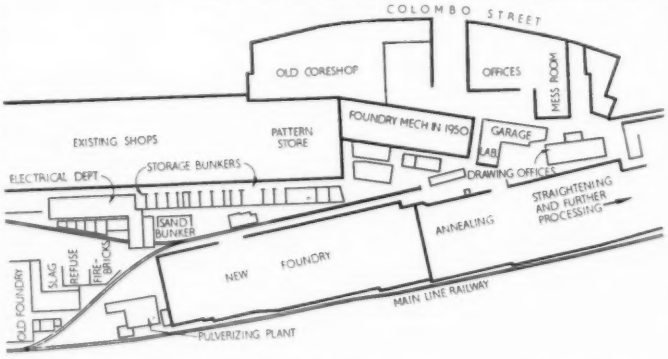


FIG. 1.—*Part of the Colombo Street works, Derby, of Ley's Malleable Castings Company, Limited, showing the relative position of the new foundry. Further development is planned for annealing and further processing on the right-hand side of the site.*

Cupolas

The overall dimensions of the cupolas are: Height to top of the wet-type spark arresters 70 ft., shell diameter 6-ft. 6-in., height from hearth plate to charge platform 22-ft. 6-in., and to the tuyeres 3-ft. 9-in. The lower portion of the lining of the cupolas is conical in shape, diminishing to 3-ft. 9-in. dia. at the tuyeres from a shaft internal diameter of 4-ft. 8½-in. The upper portion of the shaft, *i.e.*, above the charging hole, is lined with conventional firebricks and iron bricks are incorporated around the charging hole to withstand the shock of the falling charge. These extend between the charging hole and the bottom of the gas take-off. Below these, firebricks are continued down to the coolers (see Fig. 6). In between the corrugations of the coolers and surfacing them to a depth of 1½ in. ganister refractory is used; the superficial coating on the coolers being replaced after each melt.

A coke-bed height of 5-ft. 6-in. above the tuyeres is checked each time before charging commences, ignition of the cupola being by gas torch. The daily melting campaign at present is of 10½-hr. duration (7 a.m. to 5.30 p.m.), though as stated earlier, double-shift working is envisaged. The cupolas are blown at a constant rate of 4,500 cub. ft. min. (at NTP) with windbelt pressure of approximately 24 in. W.G. and air temperature of 385 deg. C. For half an hour before blowing, the recuperator is pre-heated by town's gas, after which a change-over is made to cupola top-gas.

A proprietary mixture of carbon and ganister is used for lining the Freier-Grunder tapping-box and the metal launders. The tuyeres are of the water-cooled copper type, of 6-in. i.d., and protrude 1½ in. into the furnace shaft, their design being very similar to those used in blast furnaces. Initially, some difficulty was experienced with "sculling" in the furnace adjacent to the tuyeres which has been overcome by subsequent modification to practice. Recirculating cooling water is supplied to the furnace units at the rate of 160 gall. per min. The cupolas are fitted with spark-arresters, the water for which is compensated for acid absorption, there being automatic correction by means of an addition of soda-ash, controlled from a pH meter. Gas heating of the metal launders, which connect the tapping boxes of both cupolas with a hot-metal receiver, is arranged.

Instrumentation

As is now quite usual with hot-blast, water-cooled cupolas, the plant is instrumented on a very comprehensive scale. For example, in addition to a number of volume. temperature, and gas-analysis indicators and recorders, there are charge-level indicators to give "high" and "low" signals. These are operated by fluctuations of electrical-resistance across the iron bricks of the upper part of the shaft. In actual practice, this particular method has not

proved 100 per cent. efficient, and experiments are being carried out to use a radio-active (cobalt-60) source for charge-level indication. Metal tapping-temperatures are measured by immersion thermo-couple, and optical pyrometers are also used. A complete system of blast control is incorporated to ensure a constant air-to-burden ratio throughout each " blow."

From the Schack-type recuperator (Fig. 5), heated blast is supplied to the cupolas at a temperature (in the wind-belt) of 385 deg. C. Although this particular plant will actually furnish blast at temperatures up to 500 deg. C., the temperature quoted earlier has so far proved the optimum, although more experiments, in relation to varying blast-temperatures, are in hand. The recuperator itself is cleaned out nightly with a percussion lance and wire brush.

A feature of the cooling system which the writer has not seen elsewhere is the use—apart from daily make-up—of closed-circuit water of relatively low total volume. In the water-system, which of course includes the electric-furnace circuit, there is incorporated a Heenan and Froude forced-draught cooler. As an emergency stand-by, mains water can also or alternatively be employed for cooling (see later).

Charging Plant

For charging the cupolas, a 25-cwt. capacity " S "-type swivelling machine has been erected to serve both furnaces, and employs a drop-bottom bucket. The actual charge comprises 1 ton metallics, 250 lb. coke, and 40 lb. limestone. In addition to the 250 tons of bunker coke in the reserve stock, at floor level, there are service storage-hoppers (Fig. 4) for coke and limestone, of 20- and 15-tons capacity respectively, complete with vibratory feeders which deliver the material, in sequence, to the charge weigh-hopper. The latter is fitted with a recording-type weighing machine. A significant feature here is the fully-automatic charging sequence, needing but one man for its control. Charging is, in fact, initiated by the crane driver situated in the cab of the 5-ton o.h.t. Wellman crane, which spans the stockyard and from which unloading of trucks of raw material also is effected by means of magnet and grab. This operator first—by means of selective discharge from the lifting magnet—weighs the metal charge into the weigh-hopper. A typical metal charge comprises 50 per cent. return scrap, 10 per cent. silvery pig-iron (8 to 8.5 Si), and 40 per cent. scrap (mainly plate and bar croppings). The actual amount of metal discharged to the weigh-hopper is indicated to the crane driver on a " slave " dial. When the next charge is required in the furnace he presses a button which records the weight of the hopper's contents and then the cone bottom of the weigh-hopper opens to deliver

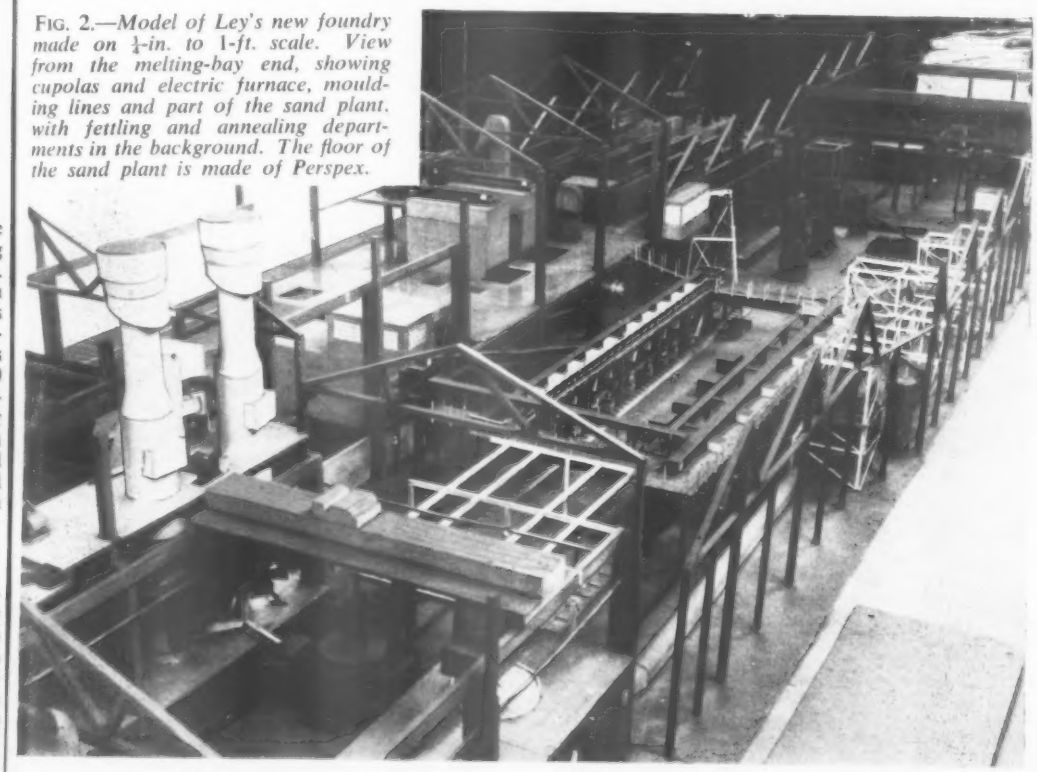


FIG. 2.—*Model of Ley's new foundry made on ¼-in. to 1-ft. scale. View from the melting-bay end, showing cupolas and electric furnace, moulding lines and part of the sand plant, with fettling and annealing departments in the background. The floor of the sand plant is made of Perspex.*

its load into the waiting charge-bucket. When the weigher pointer returns to zero, the hopper doors close and the charge-bucket moves off, stopping first underneath a separate coke and limestone weigh-hopper where an automatically prepared charge of these materials is waiting. Durham coke is used, the coke-to-metal ratio, including the bed coke, being 1 : 7.9, or without the bed, 1 : 8.8. Again, automatic delivery is arranged and then the bucket moves upwards, discharges its contents into the cupola as the consequence of a " trip " mechanism, and returns to its original position. During this time, the next coke and limestone charge is automatically prepared and its weight recorded. All these operations are carried out by the cranedriver, initiated by pressing his one control button. It is satisfying to record that a charge-weighing accuracy of about 1 per cent. is currently experienced. As a safeguard against breakdown, a spare magnet is available.

Receiver

Metal from the cupolas is continuously delivered by launder into a 4-ton capacity U-shaped tilting receiver, furnished with monolithic lining. This is gas heated before starting up, but not again during the day's run. The receiver is of somewhat special design in which is incorporated a hydraulic tilting and advancing mechanism which enables it to deliver metal (by push-button control from a pulpit) directly into the 12-ton capacity arc-furnace.

The receiver (of which a spare is kept lined and ready for use) is patched and checked every 14 days and normally has a 5,200-ton throughput between relinings. To the spectator, the transfer of molten metal to the electric furnace is carried out with almost uncanny precision—the result of painstaking calculation, design and prototype-model construction by Ley's engineers. The receiver actually moves forward first and then in continuance of the movement, the specially-shaped pouring lip enters right inside the electric furnace, 1 ton of metal being delivered in this way every five minutes. Control of this addition, operation of the furnace door, as well as delivery of the metal from the electric furnace into pouring ladles, is effected by one man, situated at a press-button pulpit erected on the cupola-furnace lower-platform.

Electric Furnace

The electric-arc furnace (Figs. 7 and 8) is of the normal three-electrode design, with 8-in. dia. electrodes. It is of 2,000 kva rating and the nose-tilting type, with Amplidyne electrode control from a separate transformer house. At first sight, it might be thought to be underpowered, but it should be made clear that apart from melting a cold charge of about 5 tons after each weekend shut-down, the furnace is not required to do anything except superheat and refine.

The bath of the furnace is lined with a special bottom-ramming composition which, with weekly patching, is still in place after approximately 12 months' use. A roof " life " of 11 to 12 weeks (or 7,000 tons throughput) and a wall life of slightly

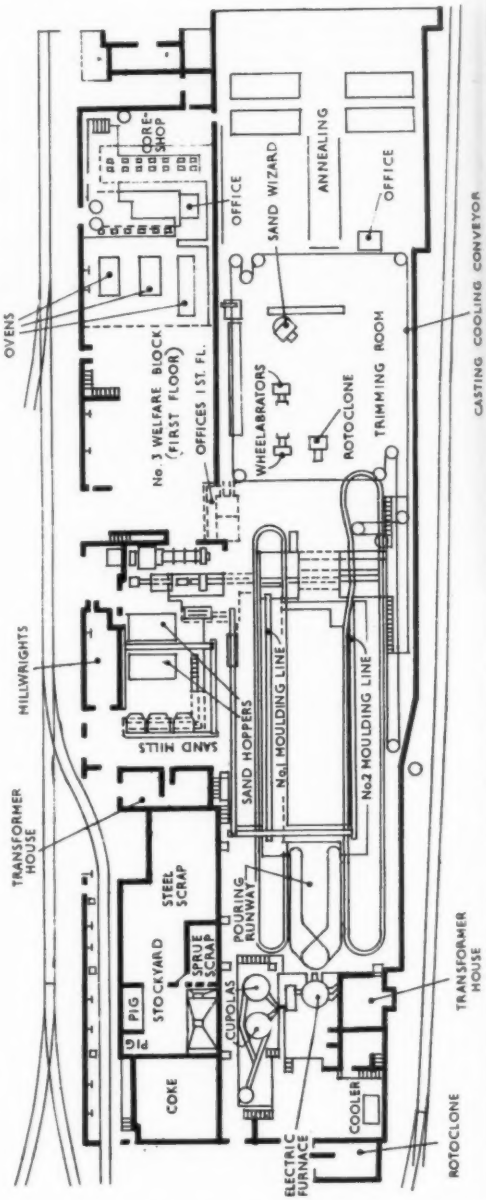


FIG. 3.—*Plan view of the new foundry, showing the disposition of the various sections. Re-equipment of the annealing section is not yet complete.*

FIG. 4.—*View of stockyard, showing charging crane and magnet, coke and limestone hoppers and, in the right background, part of the swivel-type skip-charger.*

less, obtained from silica-brick linings, represent the experience to date. Pouring from the electric furnace is a more-or-less continuous operation, metal being taken in two sizes of drum-type ladles (of 500- and 900-lb. capacity), both suspended from powered hoists (Figs. 9 and 10). The temperature of the metal stream from the electric furnace is monitored by a radiation pyrometric indicator and recorder.

An addition of around 10 per cent. of cold steel scrap is incorporated at the electric furnace as required and then, if needed, ferro-silicon and ferro-manganese are used for composition control to give metal containing C 2.45, Si 1.35, Mn 0.44 and S 0.15 per cent. Metal samples are withdrawn from both the receiver and the electric furnace at intervals of 50 min. for analysis in the spectographic laboratory and control of the furnace metal bath.

In transferring the metal from the cupola through the receiver to the electric furnace, there is a temperature loss of about 50 degrees, so that metal reaches the electric furnace at about 1,450 deg. C. Here, the 10 per cent. by weight of cold steel scrap is added to each transfer. The input of cold steel and cupola metal to the electric-arc unit is so synchronized as to eliminate variation in composition of metal delivered from the furnace.

Although the electric furnace is of standard basic design, many special features have been incorporated in the melting plant as a whole to ensure good working conditions, coupled with optimum control. Amongst these might be mentioned the installation of an exhaust canopy above the electric furnace (Fig. 8) which leads to a Rotoclone dust-collection unit outside the building (capacity 20,000 cub. ft. per min.). The ductwork of this unit is hinged at the forward side of the furnace so that the connections need not be broken when tilting.

Electrode consumption when using the electric furnace in this way as a duplexing unit is but $3\frac{1}{4}$ lb. per ton throughput, a figure which is surprisingly low, bearing in mind that dust- and fume-extraction at an arc furnace usually much increases electrode consumption. A bath of about 6 tons of metal is held overnight in the electric furnace and needs only occasional arcing. Another good-housekeeping feature of the plant is the use of a number of transporter racks, of welded construction, each to convey and store 12 electrodes; these have the advantage both of reducing mechanical damage to a minimum and effecting convenience of storage and transport.

MOULDING, POURING, SHAKEOUT AND FETTLING

First Moulding Line

As will be seen from the plan of the foundry reproduced in Fig. 3, two mechanized moulding lines are included, side by side, in line with the melting plant, with the pouring runway running between the mould-conveyor loops. Alongside the moulding plant are its servicing sections—for sand preparation and reclamation, coremaking, maintenance, etc.

Mechanization with Flexibility at Ley's

The smaller of the two moulding lines (No. 1) is served by ten BMM. BQ1 moulding machines (Fig. 11), of the shockless jolt/squeeze jaw-lift type. The models are left-handed, with a draw-frame specially designed by Ley's. In fact, the entire design of the machine is the result of close co-operation between Ley's and the makers to suit the company's special requirements. The machines handle 18- by 13 by 6- by 6-in. box-parts, Sterling rolled-steel moulding boxes with a special joint flange and fixed steel pin in drags being used throughout. As an example of thoroughness of design, cope handles are staggered to avoid trapping operators' fingers when closing is taking place on to the removable taper pin. One round and one slotted bush are used in the cope box.

Automatic control of the machines is arranged from a pedestal situated behind the operator in such a location that he is clear of his machine when pressing the starter button for the moulding sequence to commence—one of the many "built-in" safety features of the plant. The moulding machines are mounted on 10-ft. high trestles from a basement floor, the height of each machine varying so that working heights for drags of castings and copes are identical. This is a device which both reduces operator fatigue and takes account of the slope of the mould conveyor. The height of the pallet for the operators making drags is based on a comfortable half-turnover movement of the mould as taken from the stripping frame. The conveyor height at each cope machine (Fig. 12) is based on bringing the box just over the closing pins, *i.e.*, hence, the operator virtually does no lifting. This last point is very important as each operator actually completes 120 moulding cycles per hr.

The mould conveyor represents a complete loop design at 176-ft. centres, incorporating 168 cars, each 21 by 13 in. in size at 27½-in. pitch, and of the single-axle, double-wheel type. The conveyor has a vertical caterpillar dog-type drive with infinitely variable speed between 200 and 400 cars per hr. Box-parts from the shakeout (about which, more later) are returned by a Ewart pendulum-type monorail chain-conveyor with constrained vertical hangers, one box-part being carried on each hanger. These move at a speed which can be varied to match that of the conveyor.

Second Line

The second moulding line (see Fig. 13) consists of six BMM. model BQ3 machines, each incorporating special automatic control valves. These machines handle moulding boxes, size 30 by 21 by

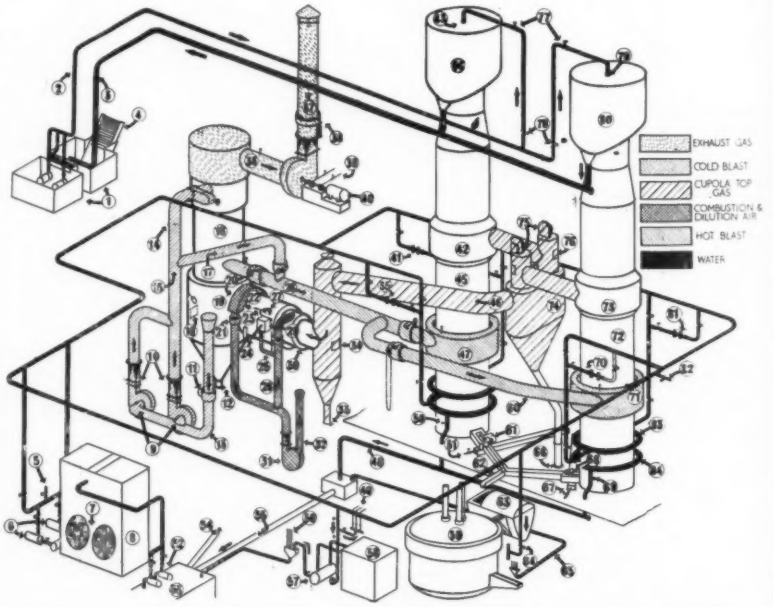


FIG. 5.—*Schematic drawing of Ley's hot-blast, water-cooled cupola plant. Indications are given of the blast, top-gas, recuperator, and cooling-water systems.*

KEY: (1) Dust suppressor, water tanks and pump; (2) feed water; (3) dirty-water return; (4) sludge ejector; (5) emergency town's-water supply; (6) delivery pumps; (7) cooler fans; (8) Heenan & Froude water-cooler; (9) main blowing fans; (10) fan-isolating flap-valves; (11) Foxboro' control valves; (12) dust valve; (13) metering tube; (14) air-flow switch; (15) cold blast; (16) recuperator; (17) by-pass; (18) inspection door; (19) fire-box; (20) dilution air; (21) dilution air-valve; (22) gas; (23) air; (24) gas; (25) air; (26) combustion air; (27) pilot burner; (28) hot blast; (29) pre-heat burner; (30) top gas burner; (31) combustion and dilution air fan; (32) metering tube; (33) dust valve; (34) inspection door; (35) water meter; (36) exhaust; (37) exhaust; (38) waste-gas exhaust valve; (39) cooling-water supply to bearings (exhaust fan); (40) exhaust fan and motor; (41) water meter; (42) gas offtake; (43) spray; (44) dust suppressor; (45) No. 1 cupola; (46) cupola top gas; (47) hot-blast wind-belt; (48) cupola return water; (49) furnace feed water to electrode glands; (50) thermometer; (51) water for slag granulation; (52) suction pumps; (53) hot sump; (54) overflow to drain; (55) return water from cupolas and furnace; (56) electrode glands return water; (57) oil cooler; (58) transformer; (59) electric furnace; (60) hot blast; (61) slag; (62) iron runner; (63) hot-metal receiver; (64) furnace feed water (doors, roof, etc.); (65) furnace return water; (66) dust valve; (67) water for slag granulation; (68) slag; (69) thermometer; (70) water meter; (71) hot-blast wind-belt; (72) No. 2 cupola; (73) gas offtake; (74) dust-catcher; (75) top gas valves; (76) inspection door; (77) regulating valves; (78) regulating valves; (79) spray; (80) dust suppressor; (81) water meter; (82) emergency town's-water supply; (83) cooling-water feed ring main for cupola hearth segments and copper tuyeres, and (84) return-water ring main.

6 by 11 in., the drag parts (6-in. deep) having special end-flanges to suit the automatic shakeout.

Production is maintained at 180 moulds per hr. on this line, with two pairs of moulding machines in work, one operator making drags and two making copes. Mould clamps are knocked on by two men, situated just clear of the pouring station. This mould conveyor loop (which, like its neighbour, was supplied by the associated firm, Ewart Chainbelt) has 200-ft. centres with cars 3-ft. by 2-ft., mounted on two axles and connected by universal chain to allow articulation in both the horizontal and vertical planes.

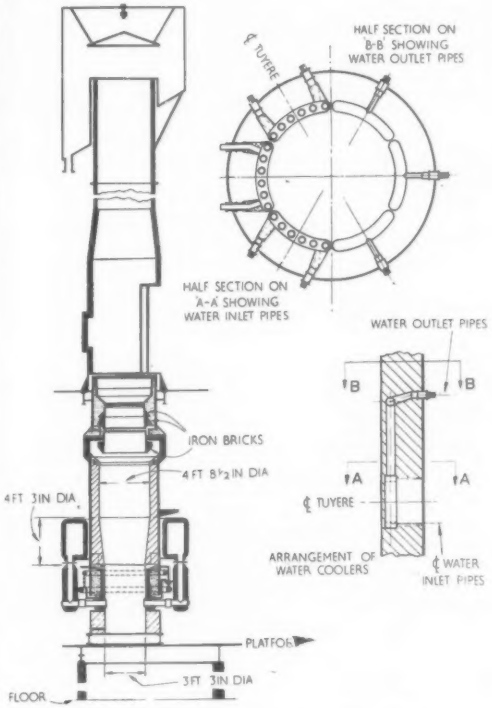


FIG. 6.—*Part section and part detail views of one of the cupolas, showing the interior construction and lining, in addition to the cooling inserts.*

Again, the conveyor height at the drag-mould delivery points is based on a comfortable working level for the coresetter (Fig. 13) and, as before, the conveyor inclines downwards before the cope-moulding points so as to provide a convenient working height for closing the cope boxes. The actual closing operation is carried out by one man.

Box-return System

Moulding boxes from the shakeouts are conveyed by a slat conveyor, 24-in. wide, the speed of which is related to the mould-conveyor travel, and boxes are fed into a fully-automatic box-feed device by means of photo-cell-initiated sweep-arms. The feed device selects top or bottom parts and offers them forward to a "dwell" conveyor, which then inclines to roll the box-parts forward on to a lift table. The latter operates in conjunction with the moulding-machine draw-frame, and ensures that, as a finished mould is pushed out of the machine, an empty box is available for rolling into the machine. The dwell arrangement allows latitude between the supply of empty boxes and usage at the machine. Finished half-moulds run first on to a horizontal conveyor which is 4-ft. 6-in. long and aligned with the strip frame. Afterwards, a specially-designed jib-crane, operated by one man, is used to lift the mould and turn it over on to the mould conveyor pallets (in the case of a drag-half) or swing it over the conveyor for closing (in the case of a cope-half).

Working Sequence

The working sequence for the drags and copes respectively is as follows:—

For the drag-moulding operation: One man feeds in an empty moulding box, lowers it on to the patternplate by returning the pattern draw-frame, fills the box with sand from the manually-controlled overhead hopper, and starts the machine cycle by pressing a button. Whilst the mould is being made, the operator swings the jib-crane, lifts the half-mould previously made, rolls it over and carries it to the mould conveyor, lowers it on to a pallet, detaches the bale of the hoist, and returns to the machine. The half-mould which was made and stripped during the carrying-out operation is then pushed on to the run-out conveyor and another box is fed into the machine from the left-hand side by means of the automatic-feed device.

For cope half-moulds, one man gets an empty box from the feed device, rolls it on to the machine draw-frame, lowers the box on to the patternplate, sets any top-feeders required, fills the box with sand by manual operation from the hopper overhead, and starts the moulding cycle. At the end of his moulding cycle, the operator raps and removes loose top-feeders (if used), disposes of the mould to the run-out conveyor, and feeds in a new box from his left-hand side by means of the automatic-feed device. During the whole of this cycle, the second cope operator lifts a half-mould from the run-out conveyor, swings it to a mould pallet, sets the closing pins and closes on the cope. Closing pins are left in the box until after clamping.

To reduce jib-crane inertia, a particularly interesting planning feature is that the mast length is kept short. The lower end of the mast is mounted on a trestle which is used as a table for temporarily accommodating a supply of cores, and thus provides intermediate storage between the main core-racks and the operator engaged on core-setting. The special design of the jib-crane allows of full working headroom for the core-setting operator at all stages of the jib movement, and the cranked jib itself can nose under the moulding-sand hopper to lift the moulds directly from the draw-frame to give a 15-in. draw instead of the standard 12-in. of the particular design of moulding machine chosen. The moulding-machine squeeze-boards carry ramming

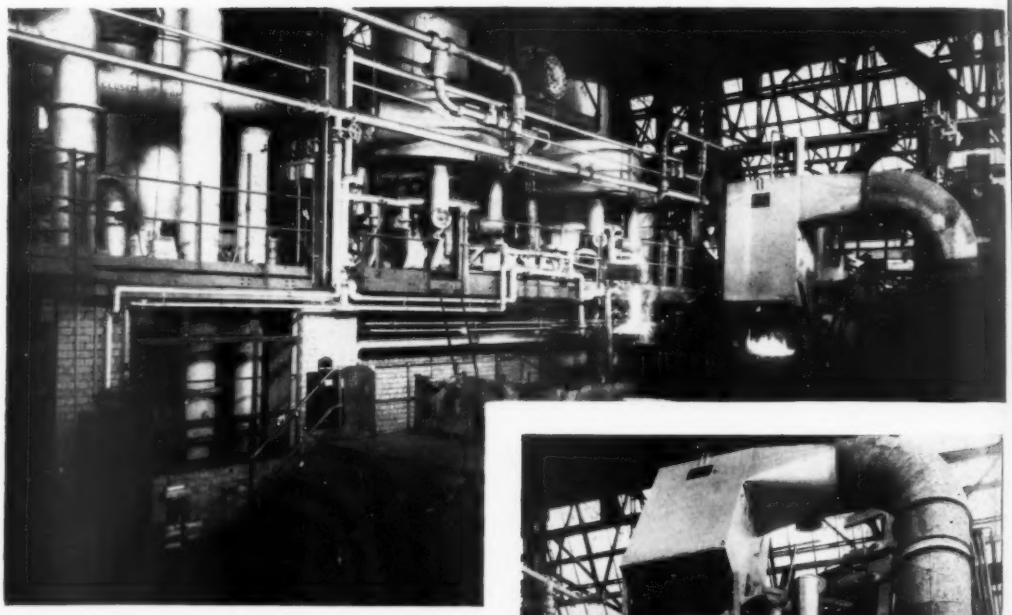


FIG. 7.—(*above*) *General ground-level view of the melting and superheating plant: Recuperator system (left); cupolas (centre), and electric furnace (right). In the foreground is some of the steel scrap which is added cold to metal in the electric furnace.*

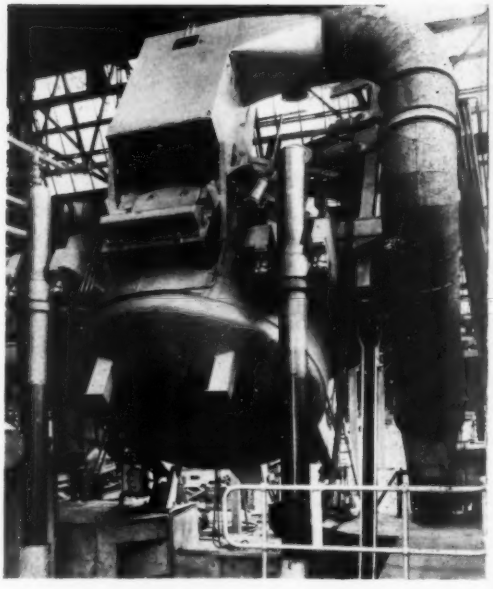


FIG. 8.—(*right*) *Rear of the electric-arc furnace photographed while it was tilted to the "drain" position. Note the hydraulic tilting gear, the fume-extraction hood and the hinged trunking.*

strips and deflector blocks as required. Steel squeeze-heads are used on cope machines and the runner cups are moulded directly into the cope.

Pouring

Pouring is carried out on a suspended-type monorail runway (by British Monorail), (see Figs. 9 and 10) and incorporates fully-automatic track switching to permit separate pouring loops to be operated. The small moulding line (No. 1) uses the 500-lb. lever-operated drum-type ladles and these are suspended from Demag electric hoists. Each ladle is operated by one man. The large moulding line uses geared ladles of 900-lb. capacity and these, too, have a suspension identical with those used for the small moulding line, and again they are one-man-operated. On the pouring part of the unit, a chain conveyor is installed which drives ladle- suspension trolleys at the same speed as the mould conveyor, when engaged with a "dog-finger" operated by the pourer.

As mentioned earlier, ladles are filled directly from the nose-tilting electric-arc holding-furnace, which is under the control of an operator mounted above the furnace spout. As this man is responsible for the filling of the ladles and also the filling of the electric furnace, he is thus able to provide, from experience, the necessary inter-relationship between the requirements of the melting and moulding departments. Specially-designed gas-burners are installed for preheating the ladles and for maintaining their temperature during break periods. Both types of ladle have covered lids and are lined with rammed ganister.

Shakeouts

There are two shakeout units (Figs. 14, 15 and 16) installed in the new foundry which operate on

similar principles and differ only where necessary to accommodate differences in moulding-box size. Briefly, their *modus operandi* is as follows:—

After cooling, the moulds are pushed off the conveyor-car tops by pneumatic rams, themselves operated by photo-electric cells, and which are mounted to form a gang—a feature which ensures an accurate alignment of the mould before pushing occurs. The moulds are pushed on to vibrating rails—formed as part of a specially-adapted vibratory conveyor—which support the box-parts only, and allow sand and castings to fall clear of the box on to a shakeout grid. (No bars are used in cope or drag box-parts). Next, the empty moulding boxes are transferred by pneumatic grapple—operated by limit switch—on to powered rolls which, in the case of the No. 1 moulding unit, deliver the boxes to the point where the operator separates cope from drag and hangs both on to hooks on the Ewart pendulum-type monorail conveyor.

On the No. 2 line, the empty moulding boxes are transferred to the 24-in. slat conveyor and an operator, using a pneumatic hoist, lifts the cope and allows the drag to be conveyed from underneath it before lowering the cope on to the conveyor behind the drag, so that alternate cope- and drag-parts travel along the box-return conveyor. After closing, loose pins are removed on the large moulding unit, and the operators, after pouring, remove clamps. On the smaller unit, the drag boxes have fixed stub pins.

Castings from the shakeout grid vibrate and travel by gravity on to a hot-castings conveyor, which delivers them into a hopper chute from which they are discharged *via* two gates into cooling buckets suspended from a monorail-type cooling conveyor. The operation of the hopper-chute gates is automatic. This hot-castings conveyor is a standard P.A. Ewart torsion-mounted oscillating conveyor. Sand falling from castings whilst they are being conveyed is discharged through the oscillating conveyor trough by a grizzly-bar screen, which returns it to the shakeout sand system. To prevent jamming, the end of the oscillator carries a flap which dams the flow of castings during the hopper-chute discharge into the cooling bucket. Sand passing through the shakeout grid falls on to the sand-return belts which also collect spillage sand from the moulding lines.

Castings Handling to Annealing

Castings are deposited from the chute following the oscillating conveyor into cooling buckets (3-ft. 6-in. by 2-ft. 6-in.). These cooling buckets have one perforated side and are suspended from a monorail conveyor (by Ewart Chainbelt), which provides for 2½ hours' duration of cooling before their discharge. The conveyor (Fig. 17) has a total length of 684 ft. of which 470 ft. is used for effective cooling; it is fitted with three drives, each of 5 h.p., and these are connected *via* fluid couplings. The weight of castings dealt with in the conveyor circuit is in the region of 100 tons. The cooling buckets pivot through trunnions mounted on a bridle, and are constrained from overturning by

FIG. 9.—*Lever-operated drum-type ladles of 500-lb. capacity in use on the small-mould line (No. 1).*

gravity-operated pegs. The emptying of the cooling buckets is automatic and is effected by a device which releases a latch over each bucket whilst maintaining control throughout the tipping cycle. After being emptied, the bucket is returned

FIG. 10.—*Geared ladles of 900-lb. capacity being used for pouring on the large-mould line (No. 2). Note the use of hoist blocks fitted with latch-in trips to engage an overhead powered chain-conveyor, so as to synchronize ladle movement with the mould conveyor.*

FIG. 11.—*Model BQ.1 moulding machines making drag-half moulds having a deep-stepped joint-face. The operator (right) is turning over a mould on to the conveyor; the special draw-frame of the machine at the extreme right can be seen in stripping position. The pendulum conveyor for empty-box return is visible in the background. Special pattern-supporting stools, fitted with electric heater-elements, are shown in the left foreground, awaiting pattern changes.*

to its upright position and the latch is re-engaged (provision is made for stopping the conveyor should the latch not engage properly). After being emptied from the buckets, the castings fall *via* a chute (the angle of which—to reduce tumbling—is set at less than the friction-angle of sliding castings) and are deposited on a vibrating conveyor, the end of which contains slots to remove adhering sand.

From the vibrator, the castings are delivered to a Standard P. A. Ewart torsion-mounted oscillating conveyor (3-ft. wide by 50-ft. long) with a flat working surface for sprue removal (Fig. 18). From this, castings are removed by the sprueing operators and sprues and foundry scrap are sorted into tote boxes which are transferred back to the stockyard area. They are transported by rotating-head fork-lift truck, which empties the tote boxes over a steel baffle (12-ft. 6-in. high) surmounting a sprue-storage bunker in the scrap yard.

All the sand from the castings which is separated by the vibratory conveyor, is conveyed through a duct 9-in. sq., mounted on the oscillating conveyor and inclined upwards at 2 deg., and is deposited in a tote box for removal as waste. Sand separated from castings on the sprueing conveyor is collected through a grizzly-bar screen and deposited in another tote box also for dumping.

"Hard" Fettling

Good castings after sprueing are placed in box pallets for removal by pallet truck to the automatic chargers of Tumblast machines or to a rotary cleaning machine (Fig. 19). After cleaning, castings from the Tumblast machines are conveyed by box pallet to the inspection areas, and large castings from the machine table are loaded on to a rubber belt conveyor. Operators alongside the belt take off castings for inspection and removal of flash, prior to placing them in the box pallets for subsequent delivery to the annealing section.

ANCILLARY SECTIONS

Indispensable, of course, to the operation of any foundry are the sections devoted to sand-preparation, coremaking, employee welfare, general handling, maintenance, etc. For the sake of logical presentation, descriptions of these sections of Ley's new foundry are gathered under the above title. It must not be inferred, however, that operations embodied therein are any less vital to the well-being and operation of the foundry, than melting or moulding, for example. Indeed, it is the integration of all sections and their design on the basis of modern engineering principles (discussed later) which is a most notable feature of this plant when

assessed as a whole. It can be stated quite categorically that it is absence of this integration and overall planning which, on all-too-many occasions, has marred a number of foundry development schemes in the past.

Sand Plant

Used sand is stored in two main bunkers—each of 120-tons capacity—and discharged by four rubber belts on to a series of conveyors delivering above the sand mills, *viz.* three, 30 tons per hr. continuous units installed in parallel. Sand is discharged, by means of a plough, from the main feed-belt from the storage hoppers to feed the first two mills, and runs over the end of the conveyor to feed the third. Dry clay-bond and coal-dust are stored in separate bifurcated hoppers and discharged to the mills by feeders. Water is added by means of sparge pipes directed on to the rollers, and is measured by a continuously indicating rate-meter.

After leaving the mills, the sand is conveyed to a disintegrator and from this, *via* inclined belts to gain height, to the mould-line distribution conveyors. Both mould-lines are in parallel between the common feed conveyor and the shakeout conveyors, so that the moulding lines can operate independently if required. Ploughs (Fig. 20), which operate automatically on demand, are fitted over each moulding-machine hopper and are controlled by two probes, the length of which is designed to limit the hopper filling to about half its capacity—this has been proved to act in a positive manner to reduce sticking. Spillage-sand conveyors are installed beneath each moulding line and any excess sand from the ends of the distribution conveyors is discharged *via* trunking on to the spillage conveyor.

Used sand from both shakeouts (together with the spillage sand from each moulding line) discharges on to a return-sand belt. Here, it is significant that this return belt system is divided to limit maintenance work and replacement costs in view of the heavy-duty to which these belts are subjected. Two belts run in tandem, the second travelling at twice the speed of the first. An overband magnetic separator is fitted just before the return sand is elevated, this latter movement being effected by a Ewart elevator having twin rows of staggered buckets of special free-discharge design; this delivers the sand into a rotary screen. Sand from the screen is then collected by a rubber conveyor belt and taken higher by a second Ewart elevator to discharge on to belts serving the main storage-bunkers. The first elevator has 40-ft. vertical centres and the second, 36-ft. vertical centres.

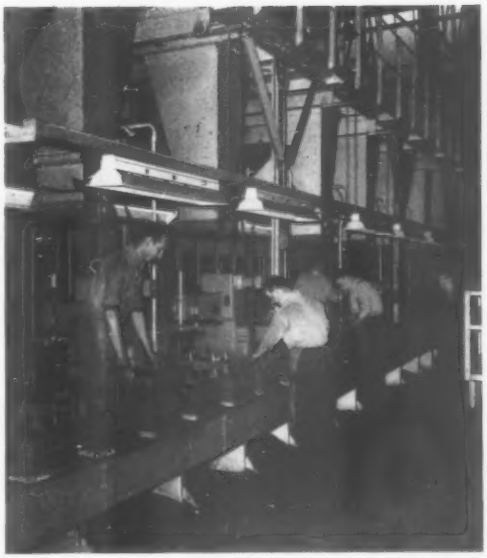


FIG. 12.—*Part of the battery of BQ.1 moulding machines at the cope station, showing the core-setting operation. The machine operator at the left is withdrawing loose closing-pins.*

FIG. 13.—*Large-mould line (No. 2) at the coresetting station, showing the declined section where the conveyor loses height to accommodate closing. In the background, one cope-machine operator is filling his box with sand and operating a press-button to initiate the automatic moulding cycle, while (right background), a second operator is closing a box with the aid of a special jib-crane.*

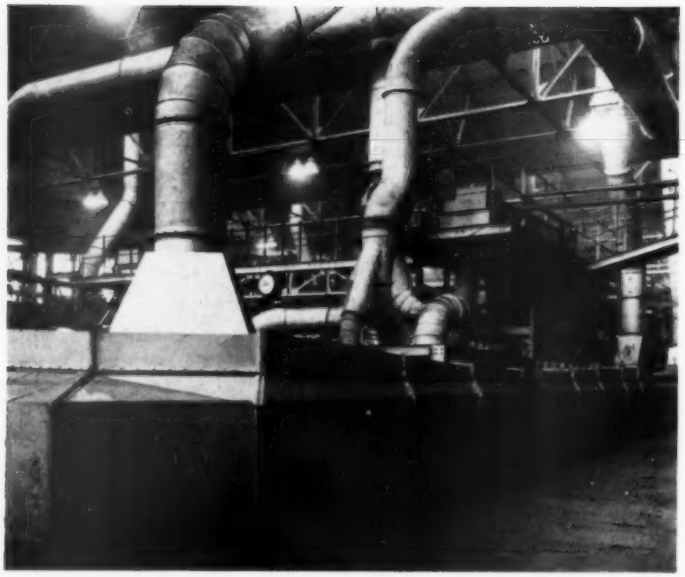


FIG. 14.—*General view from the shakeout end of the small-mould conveyor, showing the conveyor hoods, exhaust ducting and part of the shakeout exhaust system.*

All the moulding in the foundry is based on the use of a Congleton sand. This sand is generally used at 3.2 to 3.6 per cent. moisture, giving about 12 lb. per sq. in. green-compression strength, 100 permeability and a shatter-index figure of 65. The result is a sand of reasonably low moisture-content and fairly high green-compression strength, with shatter index not too high. These qualities combine to give good flowability, and uniform rammed-density. No new raw sand is added to the system, all the necessary make-up coming from the 70 tons of core-sand consumed weekly. (Sand recovered during further processing of castings after the shakeout is not returned to the system.)

Coremaking

The position of the coremaking operations in the new foundry can be seen in Fig. 3. Here, washed Congleton sand is handled by Ewart elevator from a floor-level grid into a storage hopper and thence by rotary-table discharge into a rotary sand-dryer. Dried sand is pneumatically conveyed and cycloned into twin storage-hoppers (capacity 8 tons each), which are fitted with metering shutters. These are mounted above 5-cwt. coresand mixers, and, in turn, these are located on an elevated platform above the coreblowing machines. Thus, mixed core-sand can be conveniently delivered into chutes, each chute feeding one core-blower.

Ten cartridge-type bench coreblowers are used for cores of sizes below 2-lb. weight. Intermediate weights of core are produced on large bench core-blowers and still larger cores are made on Osborn coreblowers. The bench coreblowing machines are installed inside a conveyor loop which conveys plates of cores to a three-loop vertical corestove, gas fired, fitted with a cooling blower to ensure that the temperature at the discharge end is suitable for direct handling for trimming and storing.

Cores are conveyed by Ewart pendulum-type monorail chain-conveyor with two decks—the upper deck to carry newly-made cores and the lower one for returning plates or drying shells. Cores from Osborn blowers (Fig. 21), most of which are dried in shells, are placed directly in the corestove by the coreblower operators, and for this purpose, the blowing line is situated close to the oven-loading position.

Cores are removed from the stove and trimmed or dressed, then placed into large storage-racks for transport by fork-lift truck. Sufficient storage room is provided to accommodate enough cores to ensure a steady flow into the moulding bay.

Ablutions

A welfare block is located on an upstairs area over the coreshop (see Fig. 3). It covers an area of 5,291 sq. ft. and has accommodation for 390 men in one section and 40 women in another. Washing and toilet facilities are provided, in addition to showerbath cubicles for the male operators. The two-locker system—one for clean and the other for working clothes—is operated and all lockers are heated. A separate steam-raising unit and calorifier are installed in an adjacent building so as to make the welfare block self-contained. The building is insulated with glass wool and double glazing and the floor surface is of asphalte. Ley's report that good use is made of these ablution facilities.

TABLE 1.—*Dust and Fume Extraction from Ley's Foundry.*

Location.	Capacity, cub. ft. per min.	H.p. and/or r.p.m.
Sand-mills pit	12,000/13,000	4.8 b.h.p. at 1,440 r.p.m.
Trimming and shotblasting	8,000	35 h.p. at 1,440 r.p.m.
Shakeouts and sand plant	36,000	120 h.p. at 1,480 r.p.m.
Hoods to No. 5 and 10 conveyors	8,150	1.8 b.h.p. at 1,440 r.p.m.
Pouring section	12,500 each fan	4.8 b.h.p. at 1,470 r.p.m.
Mould conveyors	5,400 each fan	1 b.h.p. at 1,440 r.p.m.
Electric furnace	20,000	65 h.p.
Compensating air to pouring section	5,000 each (2 off)	1 h.p. at 1,440 r.p.m.
Oscillating conveyor (sprue)	23,500	80 h.p. at 940 r.p.m.

Heating, Lighting and Ventilation

Lighting

General shop-lighting of Ley's new foundry is at the approximate level of 15 foot-candles and this is effected by means of dual fittings, *i.e.*, high-pressure mercury-vapour units combined with incandescent-filament lamps so as to give a blended light and to cater for the warming-up period of the mercury-vapour lamps in the case of short power interruptions. (These lamps are of a special design developed by Ley's own engineers.) At certain working points and to illuminate intricate operations, the lighting level is raised to 20 foot-candles, the enhanced light being obtained from continuous-channel fluorescent fittings (for example, those located above the mould conveyor, and supplemented by angled reflector fittings at the moulding machines).

All wiring throughout the foundry is carried out in PVC-covered steel-wire-armoured cable, with the exception of wiring for pit and underground lighting which is PVC-covered carried in PVC conduit tubes, switches and fittings. The pit fittings are of a watertight design as a precaution against possible flooding damage. For increased operator safety, all the lighting supply is at a pressure of only 110 v.

Heating

Working areas in the foundry are heated by radiant-panel units, mounted above the working stations. The disposition of these panels has been arranged to take into account the heat dissipated from the moulding lines and the cooling conveyor. The panels use steam from the waste-heat boilers serving the whole works, and are insulated on their upper surface with a fibre-glass material so as to give reflection downwards and avoid loss to the upper air. The total capacity installed is: In the hard-fettling shop 410,000, the foundry working area 126,000 and coreshop 252,000 BTU's.

Ventilation

Along the south wall of the building is a continuous run of windows which can be opened to provide ventilation during warm weather, and along one section where the castings cooling conveyor is located close to the glazing, special armoured-glass is installed.

Dust and Fume Extraction

Considerable attention has necessarily been given to the removal of fine dust and fumes from a plant which is milling and conveying 1,000 tons of sand and pouring over 120 tons of metal daily. The total exhaust capacity installed for the sand plant and shakeouts is 60,000 cub. ft. per min.; the exhaust for the electric furnace is 20,000 cub. ft. per min., with 25,000 cub. ft. per min. drawn off at the pouring section and with 10,000 cub. ft. per min. of compensating air being supplied to this point.

The cooling sections of each of the mould conveyors are hooded (Fig. 14) and fitted with exhaust stacks for the removal of steam. The exhaust capacity in the fettling department for sprue-removal operations and shotblasting totals in the region of 32,000 cub. ft. per min. All exhaust air is scrubbed in scroll-type, wet dust-arresters, the sludge from which is ejected by Ewart scraper conveyors into large collecting tanks which are in turn removed and emptied by rotating-head fork-lift truck. An analysis of this equipment, its location, capacity and horse-power is given in Table 1.

General Handling

Because of the continuous nature of the plant, most of the mechanical handling in this foundry is confined to conveyors of one type or another. But since handling constitutes such a large share of modern foundry operations, it follows that in a scheme of this sort the problem was very closely studied. In this, two viewpoints were reconciled before decisions were made, *viz.*:—what had been done and proved successful in the past, and what new methods were available or adaptable as a result of studying kindred installations, not necessarily in foundries. In the finality, the type of construction

FIG. 15.—*Close-up of the automatic shakeout unit for the small-mould line. The push-off ram has just transferred an 18 by 13-in. mould on to the vibrating rails. Also shown is the grapple for transferring knocked-out boxes from the vibrating rails to the "live" rolls. The operating photo-cell can be seen on the right of the picture.*

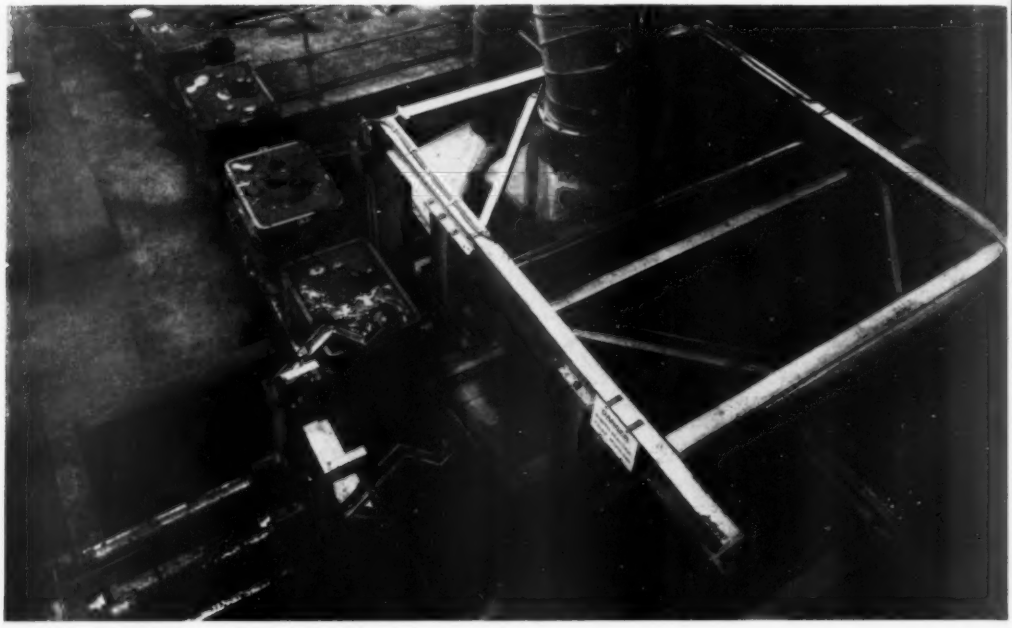


FIG. 16.—*Shakeout on the large-mould line—photographed from the overhead platform of the sand-distribution system. The photo-electric cells which operate the pneumatic push-off rams can be seen in the centre of the illustration.*

which offered the greatest flexibility was almost invariably chosen. Particular examples of this sort of pre-planning which may be cited include core handling and coal-dust usage.

Cores are stacked in racks in the coreshop by operators who carry out the core-trimming operations. These racks are transported by rider-controlled battery-operated stillage trucks and arranged alongside the mould conveyors. As mentioned earlier, the assembly of cores prior to placing them in the moulds on the large moulding-line is done on short trestles which are an integral part of the jib-cranes. On the small moulding-line, cores are placed in the mould directly from the core-rack.

Sprue and other foundry scrap is collected in 2-ton capacity tote boxes and conveyed by 3-ton fork-lift truck, fitted with hydraulic rotating-head attachment, and tipped over the wall of a bunker in the stockyard. Castings, after sprue removal, are placed in tote boxes—an operation which includes sorting—and transported by pedestrian-controlled stillage trucks for loading directly into the Tumblast machine chargers. After the hard fettling operation (Fig. 19), the castings (still in boxes) are conveyed by fork-lift truck to a storage area prior to packing for the annealing furnace.

For handling the coal-dust in the sand plant, special sealed hoppers of 12-cwt. capacity are used. These are filled from the coal-pulverizing plant elsewhere in the works (see Fig. 1), and transported to the floor level of the sand plant by fork-lift truck. A 2-ton capacity hoist block, mounted on suspension-type monorail conveyor, and incorporating a self-contained tractor unit, is used to hoist the containers of coal-dust on to a platform at an elevation of 17 ft. where they are placed into temporary storage. When in use, the portable coal-dust hoppers stand directly above the feed hopper for the sand mills which is carried from the 17-ft. high platform and coal-dust is discharged by feeder. The filling inlet on top of the transport hopper and the outlet beneath, and also the filling inlet of the fixed-platform hopper are provided with sealed shutter valves to avoid coal-dust being blown out during discharge.

Bonding material, a dry clay, is delivered by road vehicle in 1-cwt. multi-wall paper sacks and transferred on to steel stillages which are stacked in pairs and hoisted by the same crane as the coal-dust. Hoppers where the clay is fed into the sand system have a grille through which the bond falls as the sacks are opened on top of it, and which is sealed by the sack itself to prevent discharge of dust.

Yet another feature of handling at the foundry is the specially-constructed racking, designed to incorporate demountable and adjustable stillages which can be loaded from the top on to each level and the levels built up into one stillage.

Maintenance

To accommodate the requirements of continuous operation, considerable forethought has to be given

to the effect on production of a possible breakdown occurring during working hours. It is a usual—as well as a sound—policy to instal moulding machines in excess of the strict requirements of the foundry to cover both the necessity for pattern change and machine break-down. There are, however, a number of cases in a plant of the type being described where duplication is either cumbersome or not possible. These cases must receive rigorous examination and assessment must be made of their effect on production of a stoppage. There are, also, some operations carried out in mechanized foundries in which small failures are likely to bring secondary complications of great magnitude. As an example of this, one might quote a photo-electric cell which, if it fails, is not of particular consequence since replacement is both speedy and cheap, but there is a likelihood of consequential failure occurring on the piece of equipment normally operated by blacking out of the light-source. A case in point is at the automatic shakeout units in which photo-cell failure will cause the push-off rams to operate. If this should take place in such a manner as to extend a piston rod in front of the boxes advancing on the conveyor, it would result in the wrecking of the ram unit. The unit is therefore designed with one definite weak link which is relatively inexpensive to replace, but for which speedy replacement must be available. To effect this, both shakeout units have their pneumatic push-off rams mounted in a special frame which is secured by four bolts to the main structure of the shakeout. This frame carries all the pneumatic valves and photo-cell operating equipment. Thus, to replace the complete unit requires only the removal of four bolts, the breaking of one pneumatic coupling and the electrical feed. In practice, the instance of failure is very infrequent, but the quick-changeover method enables a new unit to be substituted, during short breaks, if a unit should show signs of sluggish operation.

On the No. 2 moulding line, box-parts are separated by pneumatic hoist, and here two complete units are installed. Both these are in full working order so that failure of one is overcome by its immediate replacement with the other unit at hand.

Pouring ladles are inspected regularly and, at intervals their gearboxes are completely stripped for regreasing with high-melting point grease. To ensure minimum trouble from variations in atmospheric temperature causing condensation of steam from hot moulding sand after shakeout, the elevators and rotary screen here are ventilated, but as an additional precaution, daily cleaning of all elevator buckets is instituted and the elevator casing is removed, one section at a time each week, for scraping. The sand disintegrator is cleaned twice daily to avoid clogging and to reduce wear between the rotors, caused by sand build-up.

Engineering

Something has already been mentioned of the pre-planned engineering which has been embodied in the new scheme, but a few other points are worthy of mention.

Because the majority of equipment operating in the plant is pneumatic, particular attention is directed to the supply of clean, dry air. For providing this, use was made of an existing compressor-house in which additional capacity was installed to cater for the needs of the new foundry. Air from this somewhat remote compressor-house is fed by large main into a ring-main within the new building from which tappings are taken at various production points. Two legs of the ring-main are made 8-in. dia. so that they serve also as receivers from the moulding machines and, in addition, a separate air-receiver is placed to form a junction between the ring-main and the feeder. A second receiver is located at the coreshop and the feed from this is led into a 9-in. dia. main to act as a buffer receiver for the large coreblowers. Working air is filtered and lubricated at each point of use so that the filter may be regarded as an integral part of the unit which it feeds.

All belt conveyors are provided with a centrally-grouped lubrication system, in which a number of greasing points are fed from a main supply by grease pumped at 1,500 lb. per sq. in. pressure from manually-operated lever pumps. A total of 1,400 greasing points is accommodated in this manner.

FIG. 17.—*Monorail cooling-conveyor at the loading point, showing, at the right, the delivery chute for hot castings. This chute is fitted with an air-cylinder-operated door which interrupts the interval between buckets.*

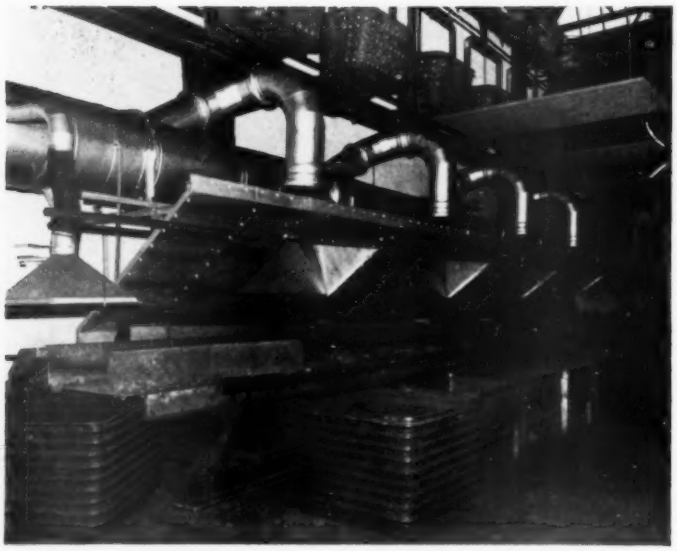
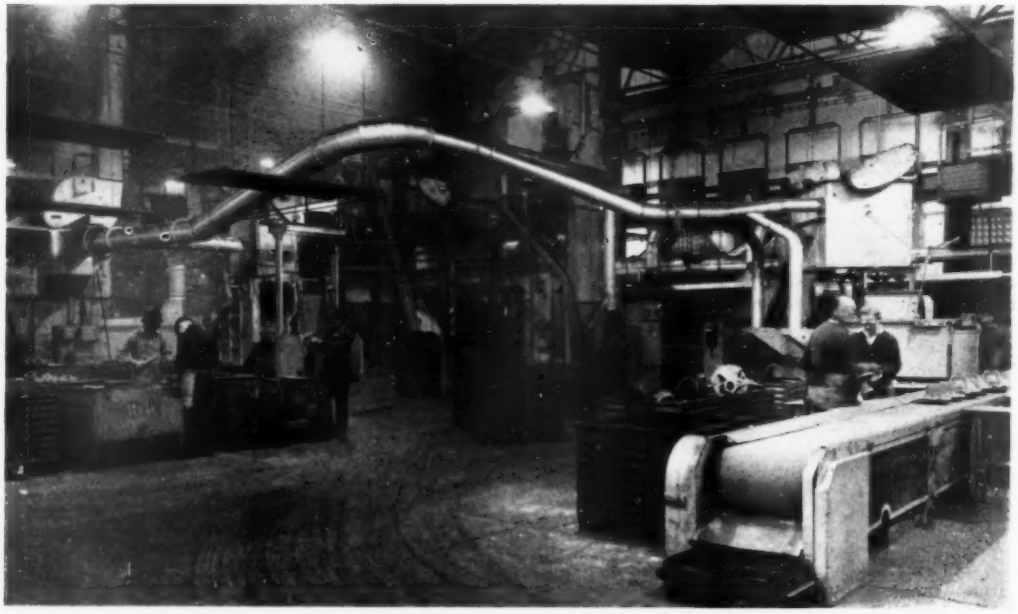


FIG. 18.—*Knocking off sprues from castings carried on an oscillating conveyor. The castings are thrown into tote boxes behind the operators, the sprues passing over the end of the conveyor into a waiting box. Note the ventilation system at the rear of the conveyor.*

The moulding machines are mounted on 10-ft high trestles which stand on the floor of the spillage-conveyor pits, thus ensuring that any vibration from the moulding machine is transferred directly to a firm foundation and does not rely on the pit walls for support. The spillage-conveyor pits, themselves, are of proofed reinforced concrete and are designed on the beam principle. Shakeout units are selfcontained structures mounted on the pit floor so as to isolate the effect of vibration. All conveyor plant in the moulding, shakeout, cooling and sprue-removal sections is controlled from one point by a push-button panel, behind which is mounted a mimic diagram (Fig. 22) with an illuminated representation of each unit in the plant. For convenience of maintenance, the push-button control operates contactor equipment mounted in a sealed panel remote from the push-buttons. All contactors are encased in sealed panels and are grouped in the form of sequences

FIG. 19.—*General view of the "hard" fettling department, showing the line of shotblast machines (exhausted by wet dust-arrester) and rubber belt-conveyor leading from the continuous shotblast machine.*



to permit the isolation of one item without the need for complete shut-down. For safety reasons, electrical sequences are fully interlocked, but after shut-down selected circuits can be re-energized with one or more sections withdrawn. Manual operating and test switches are fitted to all items of equipment. The general electrical supply is at 6,600 v. pressure (transformed to 440 v. for general equipment) and lighting is at 110 v. Duplicate feeds at 440 v. are available from outside sources, and 460 v. direct current is available from an external source for use by the stockyard and furnace-bay cranes, variable-speed conveyor drives and magnetic tramp-metal separators. The electric furnace supply at 6,600 v. is arranged independent of other supplies.

For items of equipment whose proper functioning is vital to plant operation, a number of precautions have been taken to suit each case. For example, the sand-distribution system is arranged to allow two independent loops to be operated in the event of failure of one moulding-line; electrical sequences are installed which give full sequence operation in either case by operation of selector switches. The metal-pouring monorail, which has built-in automatic electric operation, can be scaled down to give manually-operated electric power movement and or, finally, all-manual operation.

Cooling water for the electric furnace and cupolas is piped in a close circuit, fitted with duplicate pumps feeding a ring-main, so that in the event of failure of any section, it is possible to use either of the pumps and to pump in two directions through the ring-main. Duplicate electrical supplies from different sources are connected to each pump-motor so that there are four alternatives in the event of compound electrical and mechanical failure. Feed water for this system can also be supplied from two different sources.

FIG. 20.—*View from overhead of the automatically-operated ploughs feeding sand to the moulders' hoppers on the small-mould line. Some of the controlling probes can be seen, projecting downwards into the hoppers. The length of these probes is arranged to ensure adequate supplies of sand at the machines, while preventing the hoppers filling much above half capacity—a set-up designed to reduce sticking of sand.*

Design and Work-study

As mentioned at the outset, the plant is laid down to deal with a wide cross-section of work, ranging from castings weighing a few ounces up to approximately 120 lb. In this group is contained most of the types of work currently in production at the company's Derby works. Choice of moulding-box size is related to existing practice and the moulding-pin diameters and centres chosen perpetuate standards used throughout the works, so as to facilitate the employment, to a certain extent, of existing pattern equipment. It must be again emphasized that a major feature of the design is flexibility, in order to embrace as wide as possible a range of work to be made at any one time. Automatic operation has been adopted wherever possible, but not pursued to the point where flexibility is lost.

These aims have been achieved mainly by adopting well-understood and, where possible, well-tried methods, applying whatever degree of mechanization is feasible without impairing flexibility. This has meant in many cases avoidance of integration between automatic machines and its replacement by an operator-controlled handling device in order to maintain the supervision, selection and control which only an operator can exercise. The latter points are considered to be most important at shakeout and mould-closing, because of the possibility of, say, splashed metal adhering to boxes in the first case, and the risk of damage to moulds in the second case.

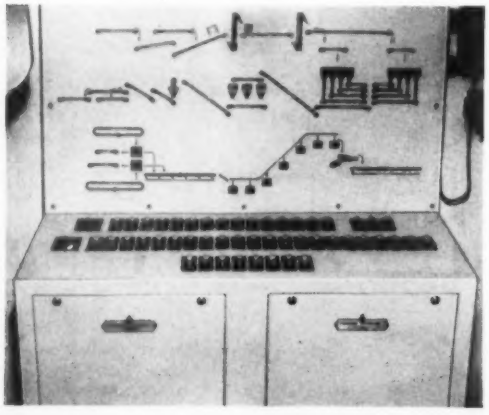
Method Study

Many months of research into different methods of achieving the desired effect preceded the development of the existing scheme. A close method-study was made of each operation and this was used as a basis for equipment selection and layout. Where standard equipment was not available, design modifications were made to standard machines in preference to designing special-purpose equipment, because it is thereby possible to make use of the experience of manufacturers in arriving at the final design.

From these preliminary layouts and methods envisaged, operating procedure and rates of working were established from synthetic data and an attempt was made to balance the duties of all operators in the plant to obtain the maximum efficiency.

FIG. 21.—*Heavy section of the coreshop; here, the cores from the Osborn coreblowers are transferred directly to the drying stove by the coreblower operators. Cores from the light section are conveyed by pendulum conveyor across the front of one of the drying stoves, where the operator removes them for loading into the stove.*

FIG. 22.—*Control "console," with stop- and start-buttons for every conveyor in the plant. At the rear of the control is a "mimic" diagram, with indicator lights. The console is housed in a cubicle which is formed beneath one of the sand-distribution conveyors.*



Despite the overall control by operators, the smallness of the manning list indicates that the duties prescribed for each man lead to his full employment. In other words, if it was decided to have control personnel at a given location, sufficient operational controls were grouped there to maintain good man/hour utilization.

Acknowledgment

The JOURNAL is much indebted to the directors of Ley's Malleable Castings Company, Limited, for permitting the preparation and publication of this account, and to the many members of the firm's staff for making information so freely available. Finally, the writer must add a word of appreciation for the help accorded by suppliers* of plant and equipment and record the industry's thanks to them also for the way in which they co-operate so effectively and wholeheartedly in projects like the one described.

The results secured at Ley's new foundry indeed provide a lasting tribute and monument to the many whose efforts have been directed to producing what surely ranks among the world's best foundries.

* A list of suppliers of plant and equipment is printed on the facing page—EDITOR.

SUPPLIERS OF PLANT AND EQUIPMENT FOR LEY'S NEW MECHANIZED FOUNDRY

Firm	*Item*
Air Control Installations, Ltd.	Dust- and fume-exhausting plant and compensating-air plant
Alfred Allen & Son, Ltd.	Coke skip
Armstrong Whitworth & Co. Ltd.	Sand rammer, balancers
Airnesco, Ltd.	Percussion lance, etc.
Airtech, Ltd.	Couplings
Audley Engineering Co. Ltd.	Valves
Aeroquip Super Oil Seals & Co. Ltd.	Hose and fittings
W. & T. Avery, Ltd.	Portable weighing machine
A.P. Manufacturing Co. Ltd.	Barrel truck and stands
Birlec, Ltd.	Duplexing furnace and receivers
Broom & Wade, Ltd.	Air-compressor, air hoists
British Moulding Machine Co. Ltd.	Moulding machines
Brightside Heating & Engineering Co. Ltd.	Shop heating
British Ronceray, Ltd.	Coreblowers
British Monorail, Ltd.	Metal-pouring and materials-handling runways
Baldwin Instrument Co. Ltd.	Air cylinders
Bells Asbestos & Engineering Co. Ltd.	Mobile screens
Colt Ventilation, Ltd.	Ventilators
Conveyancer Fork Trucks, Ltd.	Fork-lift trucks
Coleman-Wallwork Co., Ltd.	Shakeout grids
Consolidated Pneumatic Tool Co. Ltd.	Pneumatic pick
Constructional Engineering Co., Ltd.	Shot-cleaning machine
J. T. Chadwick, Ltd.	Lubrication (sand plant)
Dallow Lambert & Co. Ltd.	Dust-exhausting plant
Electromagnets, Ltd.	Magnetic separators
Ewart Chainbelt Co. Ltd.	Belt conveyors; elevators; casting-cooling conveyor; oscillating conveyors; mould conveyors; sand-handling plant; roller conveyor; box-return conveyors; pendulum conveyor for cores, and jib-cranes
East Midlands Gas Board	Ladle-heating and -drying equipment
Felco Hoists, Ltd.	Chain blocks
Foundry Equipment, Ltd.	Sand plant
Farrar Boiler Works, Ltd.	Air-receivers
Fordath Engineering Co. Ltd.	Mixers
Foundry & Engineering Co. (W.B.) Ltd.	Corestoves
Farvalube, Ltd.	Grease-lubrication unit
Fisher & Ludlow, Ltd.	Box pallets and tote boxes
Gee, Walker & Slater, Ltd.	Builder's work; plant foundations, and floors
General Electric Co. Ltd.	Switchgear, transformer and control panel
James Gordon & Co.	Gas-analysis recorder
Heenan & Froude, Ltd.	Water-cooler
Industrial & Metallurgical Equipment, Ltd.	Cupola plant
International Combustion, Ltd.	Shakeout units
J. W. Jackman & Co. Ltd.	Osborn coremaking machines
Jerram & Co. Ltd.	Cooling-water equipment
George Kent, Ltd.	Cupola-plant instrument panel
Lansing Bagnall, Ltd.	Platform trucks
R. Longdon & Co.	Compressed-air mains
Metallurgical Engineers, Ltd.	Hot-blast equipment
Midland Heating & Ventilating Co. Ltd.	Dust-extraction and cooling-water neutralizing equipment for cupola plant
John Miles & Partners, Ltd.	Melting-plant consultants
Herbert Morris, Ltd.	Electric hoists
Pyrene Co. Ltd.	Fire-extinguishing equipment
E. A. Roper & Co. Ltd.	Cupola charger and ladles
Redler Conveyors, Ltd.	Feeders
Rubery, Owen & Co. Ltd.	Stillages
Rotameter Manufacturing Co. Ltd.	Rotameters
Sankey-Sheldon, Ltd.	Stillages and racks
Geo. Salter & Co. Ltd.	Circular balance
Siddons (Redhill), Ltd.	Steel partitioning
Spencer & Halstead, Ltd.	Sand-drying and -conveying plant
Stewart Industries (Derby), Ltd.	Core trays
Syntilla Manufacturing Co. Ltd.	Coke buckets
J. Thorp & Son, Ltd.	Structural and plant steelwork
Tilghman's, Ltd.	Air-compressor and shot-cleaning machines
Tylors of London, Ltd.	Inferential meters (cupola cooling system)
United States Metallic Packing Co. Ltd.	Air cylinders
Vaughan Crane Co. Ltd.	E.o.t. crane and " Boxmag " magnet
Wellman Smith Owen Engineering Corporation, Ltd.	E.o.t. crane
R. White & Sons (Engineers), Ltd.	Railway sidings
Worthington-Simpson, Ltd.	Pumps for cooling water
Yale & Towne Manufacturing Co. Ltd.	Hand-lift trucks

AT THE WORKS of Forgrove Machinery Company, Limited, Dewbury Road, Leeds, recently, Mr. J. Horn, works director and chairman of the company's apprenticeship advisory committee, presented prizes and certificates to apprentices in recognition of their examination successes. The John Horn Shield, for the best apprentice in the training school in 1959, was awarded to Mr. D. Schofield. The apprentices gained one Higher National and eight Ordinary National Certificates, and one final certificate of the City and Guilds Institute examinations.

LODGE COTTRELL, LIMITED, of Birmingham, has secured a contract worth £720,000 for blast-furnace-cleaning plant at the new £110,000,000 integrated steelworks of Richard Thomas & Baldwins, Limited, at Newport, Monmouthshire.

OVERSEAS REVIEW, published by Barclays Bank D.C.O., states that the Ford Motor Company is to erect an assembly plant at Salisbury, Southern Rhodesia. It is planned initially to produce about 27 vehicles a day. An investment of £1,500,000 is anticipated.

Publications Received

First Report, July, 1958, to December, 1959. Issued by the Industrial Training Council, 36, Smith Square, London, S.W.1.

Reading this rather dull booklet, one learns from a series of short reports what 60 employers' associations are doing, or hoping to do, to increase, during the next few years, the number of youths in the trades they service with the laudable desire to mitigate any adverse effect of the "bulge" in school-leavers. Since no mention is made in the Report of the activities of the ironfoundry associations in this respect, it might be imagined that they have been completely idle, but in fact, apart from the work done by the British Iron and Steel Federation, no other associations have done more.

Case-hardening of Nickel-alloy Steels. Issued by the Mond Nickel Company, Limited, Thames House, Millbank, London, S.W.1.

This publication explains, with the assistance of numerous tables and diagrams, the object of case hardening steel components and the three processes employed—pack, gas and liquid carburizing. The heat-treatment after carburizing is also dealt with in detail. The publication continues with information on core properties, fatigue and carburizing defects and their elimination. The appendix provides full information on the influence of temperature and time of carburizing on depth of case.

Freight Services to and from Northern Ireland, Second Edition. Published by the Northern Ireland Development Council, 13, Lower Regent Street, London, S.W.1 (*gratis* on application).

Any foundry plant or supply house which has business connections with the North of Ireland will find this book invaluable as a guide for finding the best method of transport from amongst the many services available. They are all set out in the brochure and are much more extensive than is generally thought—for instance, the reviewer was unaware that there is a tri-weekly cargo service from Preston taking cars and lorries. There are also quite extensive shipping lines in N. Ireland regularly serving the Continent and the USA.

Standard Steels for General Purposes. Issued by K & L Steelfounders and Engineers, Limited, Letchworth, Herts.

In this publication intelligent use has been made of colour. In the index, for example, five contrasting bands of colour have been used to give immediate reference to the grades of steel covered. These include those for magnetic applications; carbon steels; low-alloy (for general and elevated temperatures and sub-zero service) and cast austenic manganese steel. Chemical composition, mechanical properties and the appropriate standard specifications are detailed.

Conference on Modernization of Forges—A Summary of the Proceedings. Published by the British Iron and Steel Research Association, 11, Park Lane, London, W.1.

The conference dealt with in this publication took place during September, 1958. Until recently the Proceedings were for restricted circulation only, which really means that the contents are of interest only to overseas readers. Those foundries abroad operating forges will find much in the book to enlighten them.

Book Review

AFS Buyers Directory 1959-1961 edition. Published by the American Foundrymen's Society, Golf and Wolf Roads, Des Plaines, Illinois, USA; price $10 (also obtainable from Penton Publishing Company, Limited, 2, Caxton Street, London, S.W.1; price 75s.).

This purchasing officers' directory of supplies to the American foundry industry opens with 140 pages of full-page advertisements. Then in section 2 are listed, alphabetically, the American equipment and supplies houses, together with their sales representatives and agents in Canada and the States. Those firms which advertise are picked out in bold type and reference is made to the page number of their announcement. Section 3 is called "Sources of Equipment, Services and Supplies." Heading No. 1 in this section covers suppliers of "abrasive bricks, stones and files," and No. 1034 suppliers of zircon sand, flour. Thus, it is true to say that the foundry industry buys a thousand-and-one things to keep it moving. The list is impressive, when it is realized that the Buyers' Guide of the British Foundry Trades' Equipment and Supplies Association contains barely 100 headings. This small list, however, does contain one item not appearing in the American book, and that is "pig-iron breakers." With the advent of machine-cast pig-iron, this plant is no doubt obsolete in the States, but they are handy when only small-diameter cupolas are employed for melting. The reviewer dislikes the continued use of "sand-blast machines" as a heading; the British have half remedied this by listing "shot- and sand-blasting machines." In the American list of sources of supply, as is usual, no addresses of firms are given and one has to resort to section 2 for this information. The next section of the "Guide" is specially useful, as it lists a number of what one might call "foundry supply merchants" and under their names gives the product numbers (in section 3) of the items they supply. Recourse to merchant supply houses enables a foundry buyer to limit the number of accounts he has to open. Against some of the firms in this category over 300 numbers are quoted, meaning that they can supply all the commodities so designated.

Section 5 of the Guide lists over 3,000 trade-names and these are classified in section 6 by the products they represent. The final section details the activities of the American Foundrymen's Society and the major trade-associations connected with the American foundry industry. The book is full of interest and carries much information of value to the British equipment and supply houses.

V. C. FAULKNER.

House Organ

Nusleca, Vol. 5, No. 1. Issued by Lec Refrigeration, Limited, Bognor Regis, Sussex.

This issue carries an illustrated description of the newly-installed iron foundry of this go-ahead concern. It replaces an earlier building which was equipped in 1947 to produce a weekly tonnage of 2½ to 3 tons of iron castings. It was a simple, but essentially tidy shop, intelligently managed. The main output of the firm is castings for the compressor units built into their refrigerators. The demand for these increased so much that the old foundry became physically incapable of maintaining output, so, when last year a site became available, a new plant was built and this is now producing 37 tons per week with a staff of 24. Shell moulding is being largely practised. The rest of the magazine is devoted to the sporting and social activities of employees at the works.

Ironmasters and Merchants of the Nineteenth Century

Excerpts from Correspondence . . . . . by T. R. Harris

Interesting glimpses of the problems associated with the manufacture of pig-iron, and the sales methods adopted in the last century, can be obtained from a perusal of the business letters of that period which have somehow survived the many salvage drives of the present century.

The following extracts are from letters written by ironmasters and merchants to a founder who used a considerable quantity of iron annually. Sometimes, the founder dealt direct with the ironmaster, whilst at other times he purchased from a factor.

Complaints

Occasionally, complaints as to the quality of the iron were made, especially when new brands were introduced and a reduction in price demanded. Writing from the Varteg Hill Works, on June 29, 1835, to a merchant at Bristol, the ironmaster stated:

"We are not prepared to make any abatement on the No. 2 Pigs. We assure you that yours is the first instance of any complaint having been made of our Iron of that quality, and we think that it therefore not improbable that it has been made without a trial, merely from the appearance of the pigs. If this should prove to be the case, we have no doubt whatever that your friends will be satisfied with them when they come to use them. In the meantime, if they will favour us, through you, with another trial, we will take particular care in the making of this iron and we are confident that we should fully please them."

A further letter, in July, refers to the same subject, and reads:

". . . it does not yet clearly appear to us that your correspondents have tried the Pigs in castings, as the proof they mention of their being bad is that in breaking them they find a great deal of White Iron, and we are well aware that some of our Pig Iron would be condemned as bad from its appearance, which, if melted, would be found to run very fluid."

In August, 1835, the agent of the Pentwyn Iron Works reported to the company the fact that a consignment of No. 2 pig-iron recently supplied to one of his customers was bad, and that they declined to use any more. In consequence of this complaint, the agent had visited the foundry and reported:

"I am sorry to say that they have too much cause to complain, it ought not to have been sold for melting; it is only by putting a very small quantity with the softest iron they have that it can be used at all, and then it is not better than old castings they can get at 2s. per cwt."

Excuses, etc.

This complaint was answered from the ironworks a few days later, the writer saying that he regretted learning of the complaint as to the quality of the iron, and that he was surprised:

". . . from the circumstance of having made numerous other shipments of a similar description, not only without having received a single complaint, but in more than one instance having had a very favourable report. Of a lot of 65 tons, friends (in London) say: 'We are happy that the Iron sent has given satisfaction to our correspondent,' and a few posts since we received an order from the same parties for 120 tons more. The letter conveying the order says: 'The party for whom we are making the purchase would prefer your iron.' A short time before your shipment, we sent 5 tons to a foundry at Bristol. Judging from the *appearance only*, the manager told the writer he was not disposed to think favourably of it, but on melting he found it so rich that he was obliged to mix a considerable quantity of old scrap—this is his own report—and he has since ordered some No. 3. We are quite ready to believe your clients would not *intentionally* raise an unfounded complaint, but as we *really know of no difference whatever* between this iron and that disposed in other directions, we must and do think it has not had fair play."

Later in the same year another ironmaster wrote:

"An Iron furnace is often very unmanageable, as has been the case with ours during the last month of bad weather; if it is put off making No. 1 we cannot ensure making No. 2, but the furnace may as if by caprice yield nothing better than forge iron."

Another case of the claims of an ironmaster on behalf of his iron not being borne out by a founder to whom he had submitted a trial consignment occurred in October, 1840. Writing from Swansea on the seventh of the month, the proprietor of the Ystalyfera Iron Works remarked:

"We had hoped that your trial of our pig-iron would have induced you to favour us with other orders before this. We are confident that your giving it a proper trial will satisfy you of its superiority, especially as to strength and fluidity in casting, and of its value for mixing with ordinary iron and old castings, and we hope you will be disposed to favour us with orders for a further quantity."

Salesmanship

The art of modern advertising was not in vogue in the early decades of the last century, but many

of the letters of the period are good examples of salesmanship. For example, the proprietor of the Dowlais Works was endeavouring to interest a founder in his iron during February, 1830, and wrote:

"For an order of 100 or 150 tons of No. 1 Foundry Iron (although our general price is £4) we will charge you but £3 15s. per ton, six months' acceptance. . . . We cannot doubt but the quality of the Iron you have been in the habit of receiving from Blaenavon is good, but we hesitate, not withstanding, to state that you will find that which we have just shipped to you inferior to none that is made in Wales."

A letter from a merchant at Holywell, in 1836, offering a founder 100 tons of Varteg Pig Iron, "at £6 15s. per ton of 2,240 lb. free-on-board at Newport," stated that:

"The iron is of the usual quality made by my friends at the Varteg, and is much cheaper than I could send you direct from the works."

He also informed his prospective customer that:

"The Varteg Iron has been made from Hot Air Blast and *Coke* for the last four years, and by using *Coke* instead of raw coal they impart a great degree of fluidity to the Iron, without in the least impairing its strength."

In October, 1838, the proprietor of the Coed Talon ironworks had received an order from a merchant for 60 tons of No. 1 Pig, and learnt that it was for a certain founder. Writing to this founder, the ironmaster stated that he was glad the iron was for him, and wrote:

"I trust that the quality will give satisfaction, and that it may be the means of establishing a regular connection between us. I should think the Coed Talon No. 1 would do well for all purposes for which you use Scotch Iron. My make is about 4,300 tons a year, of which Messrs. Sharp, Roberts & Company, of Manchester take about 3,000 tons a year, part for their own Foundry and the rest for sale as merchants to the surrounding district. My price is governed by the price of Scotch Iron delivered in Liverpool or Runcorn. At a recent meeting the Scotch Iron Masters fixed their price at £4 for No. 1 at Glasgow."

Meetings of Ironmasters

Further references to the meeting of ironmasters are to be found in a number of letters. On July 11, 1833, a merchant stated that he could not give a price for certain iron as the ironmasters' meeting was not until the next day. He did, however have some "winter make of Beauford Iron in Bristol" which he could sell at £4 5s. 0d., and he informed his correspondent: "Pentwyn are now making only No. 2."

Three years later, a further communication stated:

"I have the pleasure to inform you that, at a general meeting of the Iron Masters of South Wales, held at Newport on 3rd inst. (December, 1836), it was determined to blow out Twenty-one Furnaces, or one fifth of the number at present in blast. Thus, the quantity of Iron made will be reduced by about One Thousand Five Hundred Tons per week. It has also been arranged that the several Works are placed under the inspection of an experienced Gentleman, with the power, at any time that he may think proper, to examine the Books and thus satisfy himself, if necessary, that the resolution has been faithfully adhered to. The most satisfactory results are anticipated by the Trade from this well timed and energetic measure."

More Sales Letters

Reverting to a consideration of sales letters, the following sentence is from a letter written by a merchant at Bristol in October, 1834:

"Our principal object in writing you now is to offer you 30 to 40 tons of *superior* Clydach "S" pig-iron, which some of our correspondents prefer to Shropshire or Staffordshire Pigs. Our price to you would be £4 5s. per ton, 5 per cent. discount for cash.

Then, on January 28, 1840, the manager of the Gadley Iron Works, Aberdare, wrote to a founder:

"We beg leave to send you our prices for cold blast foundry pigs, which we can recommend as being of the best quality, of which we supply the Neath Abbey Iron Company and the foundries in this neighbourhood exclusively. We are now putting another Furnace in Blast, and are desirous of extending our connection. Our price delivered on Board at Cardiff is, for No. 1 95s., No. 2 90s., six months' acceptance or less 3 per cent. for Cash."

Again, on May 8, 1841, the manager wrote:

"Are you buying Cold Blast Foundry pigs at present? If so, we will be glad if you will give ours a trial; it stands high in the market for machinery and is well spoken of by the Neath Abbey Iron Co., who are extensive consumers of it and to whom we refer you as to character. Our present price delivered on board at Cardiff is, for No. 1 85s. per ton, No. 2 80s., six months' acceptance less 3 per cent. for cash."

In October, 1840, the manager of the Cambrian Iron and Spelter Works, Neath, also quoted the Neath Abbey Iron Company as users of this firm's iron. In the course of his letter, he wrote:

"We have just blown in our first two furnaces, and are now manufacturing as good No. 1 Cold Blast Bituminous Coke Foundry Pig as can possibly be produced in Wales, and shall have much pleasure in making a shipment for you. . . . We subjoin the Neath Abbey Co's report upon some No. 2 supplied to them, subsequent to which they have purchased our two first cargoes of No. 1." Mr. J. T. Price, of Neath, reported:

"We have just melted a charge of your Cambrian Iron in our Air Furnace, and may report that the quality is *excellent*. Our workmen say *they never saw better*. The Air Furnace proves Iron better than the cupola. Your company may *congratulate* themselves in having succeeded in making a good article fit for any market."

Spark-hardening of Metals

By N.C. Welsh, B.Sc., Ph.D.

In a paper recently presented to the Institute of Metals, Dr. Welsh discussed the potentialities of sparking techniques for hardening, and other surface effects, on metal. The first paragraph of the following article is a synopsis of his paper. This is followed by an abstract from his comments regarding the hardening of iron in particular.

The influence of electric sparks on the structure and hardness of metal surfaces has been studied by the Author, a vibrating electrode being used to generate the sparks. Each spark fuses a small volume of metal, which rapidly chills when the discharge ceases. Steel surfaces are hardened by the thermal cycling, but it was discovered that elements derived from the sparking medium accentuate the hardness change. Thus, nitrogen from the atmosphere, or carbon from an oil, promote hardening even in pure iron. The same elements confer great hardness on metals such as titanium and zirconium,

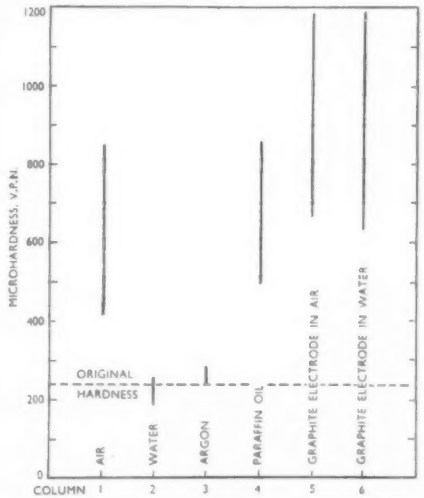


FIG. 1.—*Diagram showing the influence of environment on the hardness of sparked iron.*

which react chemically to form hard compounds. Surface alloying also occurs by the transfer of matter between the sparking contacts, and experiments with sintered-carbide electrodes show that very hard, wear-resistant layers can be formed on most engineering metals. Spark treatment has been successfully developed in Russia as a practical process for hard-surfacing steel, and wear tests carried out in the present work indicated its potential value in the non-ferrous metals field.

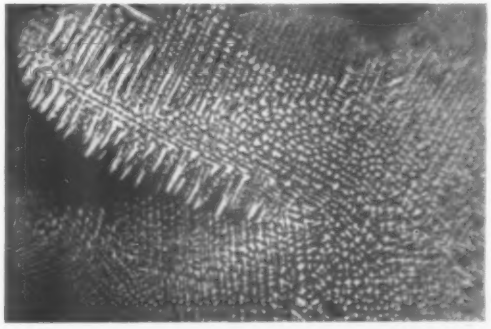
Hardening of Iron by Carbon Absorption

The effect of fortuitous alloying of iron with atmospheric elements is equivalent to an increased carbon content, though an actual change of carbon content can also readily be produced by spark action. Experiment has shown that if sparking is conducted in a hydrocarbon oil, thermal decomposition of the oil provides a strongly carburizing environment. Micro-hardness readings on low-carbon iron self-sparked while immersed in paraffin oil are shown in Fig. 1, column 4; the hardness change is closely comparable to that produced by air-sparking (*cf.* column 1).

Sparking with a Graphite Electrode

Carburization can also be effected by sparking the metal with a graphite electrode. Although the process involves the transfer of electrode matter, it is convenient to discuss it at this juncture; the experiments were in fact carried out with sparks from an a.c. source. The hardening produced by sparking iron in air with a graphite electrode is shown in column 5 of Fig. 1. The hardness values range up to 1,200 VPN, a level substantially greater than that observed on surfaces self-sparked in oil (*cf.* column 4). Some contamination with atmospheric gases must have taken place during air-sparking, but this contamination did not affect the hardness, since similar values were recorded when sparking was conducted under water (see column 6). The exceptionally-high hardness values can be attributed to the formation of a large proportion of iron carbide. A typical, though extraordinarily fine-grained, cast-iron structure could often be resolved in the layer (see Fig. 2), and the carbon concentration evidently greatly exceeded that attained by conventional carburizing methods.

FIG. 2.—*Cast-iron structure produced when iron is sparked with a graphite electrode,* ×2,000.



Spark-hardening of Metals

Carbon is apparently more readily assimilated from a graphite electrode than from thermally-decomposed oil. From a practical viewpoint, the former technique has the added advantage that the workpiece surface is less rapidly eroded. Indeed, it is probable that the carbon concentration in oil-sparked surfaces is automatically restricted by the comparatively high rate of erosion. Hydrocarbon oils are, of course, normally employed in the well-known "spark-machining" process, in which rapid erosion of the workpiece is the sole objective.

AN AGREEMENT has been concluded between D. Napier & Son, Limited, aero and marine engineers, of London, W.3, and the Sierracin Corporation of Burbank, California, whereby the UK company has been granted exclusive rights to manufacture, use, and sell the "Sierracote" and "Sierraglo" processes in Britain and Europe. D. Napier & Son is a member of the English Electric Company, Limited, group.

Home Machine-tool Orders Fluctuate

Latest figures for machine-tool orders published by the Machine Tool Trades Association show that net new home orders during November, 1959, were £5,423,000, compared with £5,838,000 in October and £3,161,000 in November, 1958. Export orders rose to £2,927,000 (£2,473,000), compared with £2,140,000 in October.

Deliveries during the month dropped to £6,690,000, from £7,120,000 in October, and just on £7,000,000 in September. As a result the order-book at the end of the month showed a recovery. Home orders outstanding at the end of November, compared with the end of October, were £38,650,000 (£38,250,000) and export orders stood at £16,350,000 (£15,090,000).

Over the year there was a substantial recovery in new orders and deliveries, but the extra spurt in September was not maintained.

The recovery is still, for the most part, concentrated at the "quality" end of the trade, but the general undertone is firm.

American Project for developing New Foundry Methods for High-duty Steel Castings

At present, most of the steel castings used in aircraft which travel at supersonic speeds are called upon to withstand temperatures of approximately 135 deg. C. In the future, however, with the projected increase in speeds of to-morrow's aeroplanes into the 1,500 to 2,300 miles per hour range, the metals used in them will have to withstand temperatures up to 540 deg. C.

Chance Vought Aircraft, Incorporated, USA, have recently been awarded a $1,000,000 US Air Force contract to develop new foundry methods for casting high-strength steel alloys for the supersonic-aircraft of the future. The contract requires the company to work with three foundries over a two-year period. The primary purpose of the project is to develop techniques of casting high-strength steel in the complex shapes required by the aircraft industry, and capable of withstanding extreme temperatures. Development data obtained will be made available by the US Air Force to all foundries making castings for military aircraft. Mr. John K. Dietz, Vought structures/materials engineer, will be project engineer for the contract (see Fig. 1).

Phases of the Contract

The contract covers five phases, the first of which will be to select three foundries to do development work on actual aircraft parts designed by Vought. The second phase will cover laboratory tests to select castable steel alloys which must be capable of being stressed to 80 to 98 tons per sq. in. Eventually it is hoped to produce castings with tensile strengths from 116 to 134 tons per sq. in. Phase three will cover the design of the actual parts to be cast for Vought by the foundries. Changes in design may be called for after preliminary castings are made. The fourth phase will involve the trial production of a contoured part in large batches, and the final phase will be pilot production of selected castings in quantities sufficient to establish consistent results. It is anticipated that cast parts, where they can be substituted for parts made by other methods, will effect considerable savings.

FIG. 1.—*Mr. John Dietz, the Vought project engineer, is shown with three examples of high-strength steel castings of considerable complexity.*

Law Cases

Labourer Sues for £4,000

A Midlothian labourer, Mr. John Drover Purves (64), who was knocked down and run over by a mobile crane four years ago, is suing his employers, McTaggart Scott & Company, Limited, Station Iron Works, Loanhead, for £4,000 damages in the Court of Session. The case is being heard by Lord Migdale and a jury.

The accident happened on February 19, 1956, in a field near the works. The crane was being used to lift heavy units and was driven by another employee. Purves was standing waiting to assist in steadying the steel table suspended from the crane. Instead of stopping the crane and lowering the cable the driver kept it in motion. Before Purves could move he was knocked down and the crane ran over his right foot and leg causing serious injuries.—Purves blames the other employee, maintaining it was his duty to drive carefully. He suffered severe injuries to his right foot and leg and had to have skin-grafting operations. The firm deny liability and state that the crane was moving steadily and slowly.

Cranedriver Not at Fault

A claim for damages by Mr. John Wilson, labourer, against Stanton Ironworks at Derbyshire Assizes on February 19 was dismissed by Mr. Justice Jones. Mr. Wilson claimed that he suffered injuries while assisting to load moulding boxes which were being lowered on to a conveyor belt by a crane driven by Mrs. Mary Syson. He said, "I was guiding the boxes down when suddenly the crane swung away from me. I was pulled forward and felt a dreadful pain." He admitted he was putting the whole blame for the accident on Mrs. Syson, and added, "She is a very good crane driver." Mrs. Syson said she could not remember the accident or any incident of it.

Machinery Not Fenced—Firm Fined

For not having machinery securely fenced William Pearson, Limited, of Clough Road, Hull, were fined £25 on each of two summonses at Hull on February 18. Mr. E. R. Rickard, Inspector of Factories, said power-presses, for long recognized as dangerous machinery, were used at the company's factory, and on a routine visit he found two machines not fenced. Mr. F. Payne, for the company, stated that there had never been an accident involving these machines.

Cumbernauld New Town

The Cumbernauld Development Corporation, Cumbernauld House, Cumbernauld by Glasgow, has prepared a brochure which sets out the advantages offered by this new town as a location for the creation of new factories. The rail, road, sea and air transport facilities are outstanding. The town is only 14 miles from Glasgow and 32 from Edinburgh. A new housing estate is available for taking care of the influx of employees for the new factories, and an illustration in the brochure of one of the types of houses available shows them to be of modern design.

A COMPUTER capable of storing up to 10,000,000 characters of information has been ordered from IBM United Kingdom, Limited, by Dorman Long (Steel), Limited, for its mill order office at the Lackenby steelworks. The machine, which is the first of its kind to be ordered in Great Britain, stores the information in the form of magnetized spots.

Mexico and Central American Business

A great deal could be done to restore the former strong footholds in the dollar markets of Central America, despite the advantages enjoyed by competitors in the USA, said Mr. F. J. Erroll, Minister of State at the Board of Trade, at a conference organized by the Birmingham Chamber of Commerce, on February 19.

He went on to say that Britain's share in the $1,710,000,000 spent on imports by Panama, Mexico and the five other Central American countries in 1958 was only 3.7 per cent. The United States supplied about 70 per cent. and Germany 6.1 per cent. Britain's trade with the zone used to be much more important, Mr. Erroll emphasized, but, he said, losses in the markets as a result of two world wars were difficult to make up. Now, however, the Central American nations wanted to reduce their dependence on the USA as a supplier and were eager to improve their trading relations with Britain. A large group of Mexican businessmen hoped to visit this country as a commercial mission in the Spring, and the Board of Trade welcomed the opportunity to show Mexico what the UK was producing and what it could sell. Last year, said Mr. Erroll, Britain's exports of new cars to Mexico had risen to nearly £2,000,000, almost three times the 1958 total and six times that of 1957. The increase had been assisted by changes made last March in the Mexican system of import licensing which had cut the prices of some British cars by about one-fifth.

Lighting for Toolmakers

Shadowless artificial lighting of a standard twice as high as that normally accepted in British industry is one of several outstanding features of a new £28,000 toolroom block at the Erdington (Birmingham) works of the Aston Chain & Hook Company, Limited, non-ferrous metal engineers.

The toolroom, which occupies the upper floor of a new two-storey building, has a floor area of 2,200 sq. ft. and the toolmakers receive the maximum amount of natural light through a large expanse of double-glass windows and roof lights. The total area of windows and skylights is 1,025 sq. ft. Artificial lighting is by fluorescent-daylight-type strips giving an average light intensity of 30 lumens per sq. ft., and at certain special machine and bench stations, and in an adjoining standards room, the degree of illumination reaches 50 lumens per sq. ft. This form of lighting is said to have made the use of individual bench or machine lights unnecessary.

Another Record for ECSC Pig-iron

The output of crude steel (ingots and castings) in the European Coal and Steel Community, at 5,896,000 *tonnes* in January, fell just short of last October's record level, according to provisional figures published by the Joint Statistics Office of the European Communities.

The figure is considerably higher than the December total of 5,620,000 *tonnes* and more than 1,000,000 *tonnes* above the 4,814,000 *tonnes* produced in January of last year.

Output of pig-iron and ferro-alloys in January reached the record level of 4,416,000 *tonnes*, against 4,245,000 *tonnes* in December and 3,606,000 tonnes in January, 1959. The previous record output was 4,315,000 *tonnes* in October, 1959.

"Gas at Work" Exhibition

Brief reference has already been made in these columns to stands of particular interest to founders at the "Gas at Work in Industry" exhibition to be held at the Royal Horticultural Hall, London, S.W.1, from March 1 to 12; further notes on this range of exhibits are now appended.

The exhibition will be open on weekdays from 10 a.m. to 6 p.m. and admission is free to trade personnel on production of tickets or business cards. Applications for tickets should be made to any of the firms exhibiting or to any of the area Gas Boards. Models, pictures of plant, and equipment for use in atomic energy, radar, electronics, aircraft, space travel and the modernization programmes for roads and railways will form the central feature of the exhibition. The show is being divided into the following main features: Heating liquids; heat-treatment; glass working; automatic glass-fabrication; flame heat-treatment; high-temperature radiant heating and gas-burners; metal melting; low-temperature radiant and convection heating; baking, and ancillary equipment.

Diecasting

Diecast Alloys Company, of London, are showing a complete pressure-die-casting unit, turning out finished castings at up to 500 per hr. Visitors to this stand will see molten metal fed under pressure into a water-cooled mould. The firm manufactures a wide range of small pressure-die-castings, and state that they use gas because of its cleanliness and ease of adjustment. Another small, compact, high-production die-casting machine (model M.55, special) will be displayed by Alfred Herbert, Limited, of Coventry. It is described as particularly suitable for intricate zinc-base-alloy castings and claimed that high production-rates are easily maintained, even when operated by semi-skilled labour. The company are agents for the D.C.M.T. die-casting machines and furnaces for zinc, and manufacturers of the Edgwick and Herbert/Reed-Prentice range of hot- and cold-chamber machines.

Treatment Furnaces

The processing involved in enamel-badge making will be demonstrated by Fattorini and Sons, Limited, of Birmingham. At this stand, visitors will be able to watch the cleaning and bright dipping of the metal stampings, the application of enamel and its subsequent firing and glazing, the removal of excess enamel by linishing, and assembly. Freedom from contamination of furnace atmosphere is a feature claimed for this application.

A small continuous furnace will be displayed for the first time for the vitreous enamelling of badges and similar small enamelled ware, including aluminium. A feature of this furnace is the use of Jetubes—radiant tubes developed by the Incandescent Heat Company, Limited, of Smethwick. A gas and air mixture is burned in a refractory-lined section of the tube; the products of combustion leave this chamber, through a nozzle, at high velocity and in so doing entrain hot gases already recirculating in the body of the tube, and so build up a recirculation system. It is claimed the system gives even heating throughout the whole tube, very high heat-transfer rates, and a flexibility of operation never before obtained with this type of heating. The furnace to be displayed can work at temperatures between 550 and 830 deg. C. Large furnaces of the same type are now reported to be producing quality enamelled ware with high outputs and flexibility. Although the furnace on display will be of special interest to the vitreous-enamelling industry, the same firing system has already been used, it is stated, for gas-carburizing furnaces, and heating soaking-pits for aluminium.

Ovens and Dryers

A gas-fired portable hot-air drying unit to be on display at the exhibition weighs but 180 lb., and is fitted with spark-ignition and flame-failure equipment. It is the Axial Jet-M. model made by Modern Furnaces & Stoves, Limited, of Handsworth, Birmingham, mainly for the foundry industry, but with other applications where quantities of hot air are required.

A "Mastertherm" continuous coreoven is to be a "live" exhibit among four types of equipment to be shown by Radiant-Heating, Limited. This oven is designed as a substitute for the traditional fixed corestove, for use in mechanized or semi-mechanized foundries. Besides reducing drying times by up to 50 per cent. and gas consumption by 30 per cent., it is intended to have the advantage of being semi-portable. A wire-drawing tunnel—a low-consumption unit used mainly in the electric-lamp industry—special types of burners, and the Caloric incinerator complete this firm's exhibit.

Miscellaneous Exhibits

Mention under this heading may be made of the oxy-gas cutting machine for steel which is to be displayed by Hancock & Company (Engineers), Limited, of Croydon. It is of the automatic type, where the cut is made to follow a pencil-line drawing (on an adjacent table) of the shape required. Other exhibits of general interest to founders are: A shaker-hearth furnace for case-hardening or surface-carbon correction; equipment for the flame-hardening of gear-wheel teeth, and a demonstration of the application of one metal to another by flame spraying. One part of the Royal Horticultural Hall will be fitted out as a small cinema for showing a selection of industrial films. A. E. Griffiths (Smethwick), Limited, of Birmingham, will be showing a direct-gas-fired air-heater unit which can be used in low-temperature ovens, drying rooms, curing chambers, etc., and which is easily adaptable for all cases where an air temperature up to a maximum of 150 deg. C. is suitable.

Hall-Thermotank declare Forecast Dividend

Final dividend of 5¼d. per 5s. share by Hall-Thermotank, Limited, engineering, refrigeration, and ventilation group, of Dartford (Kent), makes 6d. per share for the year ended September 30, 1959, as forecast, on an ordinary capital raised to £3,024,000 by acquisitions and a one-for-one scrip issue. Taking the scrip issue into account an equivalent payment was made for the previous year by J. & E. Hall, Limited, on £1,008,000 ordinary prior to the merger.

Consolidated profits for 1958-59, broadly the full year's results of J. & E. Hall and subsidiaries, plus three months' profits of both the Thermotank and Vent-Axia groups, totalled £930,416, and compares with those of £840,678 of J. & E. Hall previously.

The approximate group profit, before tax, for 1958-59 would have been £1,270,000, before charging expenses of forming the group, but after a full year's loan stock interest, had all the subsidiaries acquired after October 1, 1958, been subsidiaries for the whole year. After tax and charging group formation expenses, etc., the net balance is £262,237.

Equipment and Supplies

Centrifugal-casting (Vertical) Machine

Claimed to overcome certain disadvantages associated with older casting processes, a machine using the Dutch "Heemstede" patented technique for vertical centrifugal-casting has now been made available in the United Kingdom. This machine, operated by semi-skilled labour, is specifically designed for the rapid production of centrifugally-cast solid or cored bars of ferrous and non-ferrous alloys. The products of earlier machines of this design have for many years been almost wholly absorbed by the general engineering industry for the manufacture of non-ferrous bushes and bearings, but recently the application of this technique has been extended to include blanks for the tube-extrusion industry. In this process the metal to be cast is poured into the rotating mould, in which is positioned a stationary steel core-rod. As the metal freezes it shrinks around the core rod. The core rod on becoming hot expands, exerting a rolling effect on the cooling bore of the cast bar, thus the hardness of the material at and adjacent to the bore is increased and its surface condition vastly improved.

Advantages of the New System

It is generally conceded that centrifugally-cast materials are metallurgically and physically superior, in certain applications, to those of sand castings, and to these inherent advantages may be added those directly attributed to this patented system, *i.e.*, hardness is constant throughout the cross-sectional thickness of the tube; the bore diameter is constant and concentric with the outside diameter, and the external and internal surfaces are smooth, it only being necessary to carry out a minimum of machining within the bore to produce the specific finished dimension. At the most this machining will not exceed 0.040 in.: the discard from top and bottom ends of the cast bar is negligible. The casting machines are supplied in batteries having from four to 12 rotating tables. In any one installation these tables may produce one product of constant dimension satisfying a high-production requirement, or each table may be fitted with individual sizes of moulds and cores, producing a wide variety of sizes at the same time. Cored bars from 1¼ to 15½ in. outside diameter with bores between ½ and 12¾ in., and solid bars from ¾ to 8 in. dia., may be cast in lengths up to 5 ft., or, with the small machines, a standard length of 23 in. is usual.

Types Available

Three types of casting machine are available, ranging from small manually-operated units to fully automatic batteries of units (as illustrated in catalogue material). All operations of this automatic machine are carried out by push-button from a control-console. The core rod and mould are mechanically raised from the bar after each cast by means of two independently operated lead-screw drives which traverse the vertical height of the main column. The motor for the rotating table, situated below floor level, is also independently controlled and mould and core cleaning is carried out mechanically. Moulds and core rods may be rapidly interchanged to suit production programmes of long or short runs. The output from these machines is reported to be especially suited to tube and extrusion plants, where the advantages of a smooth and concentric bore are necessary or even essential. Other production economies in connection with extrusion can be made due to the more-even heating possible of cored bars as compared with the usual practice of heating solid bars, which have to be pierced prior to extrusion.

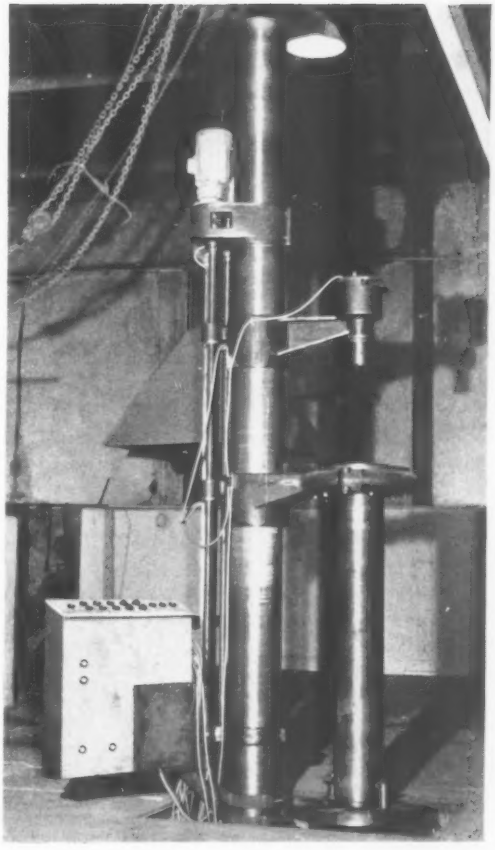


FIG. 1.—*Heemstede automatic machine for the vertical centrifugal-casting of solid and cored bar, now marketed in the United Kingdom by D.M.M., (Machinery), Limited.*

The process is shortly to be applied to the manufacture of steel and stainless-steel tubing, and installations are already operating in foundries and tube-extrusion plants in Germany, Sweden, Italy and Spain. The manufacturers of this equipment—N.V. Nederlandse Metaalgieterijen—are represented in the United Kingdom by D.M.M. (Machinery), Limited, 60, Buckingham Palace Road, London, S.W.1.

Concrete Aggregate: Lafarge Aluminous Cement Company, Limited, announce a new synthetic aggregate for use with Ciment Fondu high-alumina cement. It is claimed that the resultant concrete attains outstanding qualities of density, hardness and strength in 24 hours, and that it is also heat resistant. The new product, called ALAG, in some respects resembles a crushed basalt aggregate, with a chemical affinity for high-alumina cements.

Company News

T.I.'s Expansion Programme

Raising of £21,000,000 by a rights offer of 16,828,702 £1 ordinary shares at 25s. each is announced by Tube Investments, Limited. It is one of the biggest industrial rights offers to be made in the United Kingdom. Reference to the "large expansion programme" being planned is made by the chairman, Sir Ivan A. R. Stedeford, in his letter to stockholders. Renounceable provisional allotment letters on a one-for-one basis will be posted on March 4 to holders of February 10. The £21,000,000 from the issue is to be devoted to the increasing expenditure upon development, to creating additional capacity in the tube and electrical divisions, to a large new steel scheme, further overseas investment, and to supplying the extra working capital that is likely to be required to finance the steadily rising levels of production. It is expected that the interim dividend for the year to July 31, 1960, will be maintained at 7½ per cent. on the existing capital, but the final of "not less than 8¾ per cent." will be paid on the doubled capital. These rates of interim and final dividends, the chairman emphasizes, represent a total dividend of 12½ per cent. for the year on the increased capital.

Payment for the shares will be due as to 15s. by March 24 and 10s. by June 16. The issue will not be underwritten. Helbert Wagg & Company and J. Henry Schroder & Company will sell shares not taken up for the benefit of entitled shareholders. An extraordinary meeting will be held on March 1 to create more capital.

MIDLAND ALUMINIUM, LIMITED—Funds are needed for general expansion and to finance increasing turnover and a one-for-one rights issue at 9s. per 5s. share is announced to raise £519,210 subject to expenses. The directors expect to maintain the 15 per cent. dividend rate on the increased capital.

JAMES H. LAMONT & COMPANY, LIMITED, engineers and brassfounders, of Edinburgh—A one-for-two scrip issue is proposed. The new shares will not rank for final dividend to be declared for 1959. The proposed increase in ordinary capital, say the directors, does not imply any change in their existing policy of recommending dividends in accordance with market conditions and trading results.

STEETLEY COMPANY, LIMITED, manufacturers of refractories, of Worksop (Notts)—The dividend is again raised with a final of 10 per cent. to make 14 per cent. for 1959. Equivalent total for the previous year when there was a one-for-two scrip issue, was 11½ per cent. compared with 10¾ per cent. in 1957. Group profits rose from £2,014,004 to £2,430,613 and the net balance, after tax, from £956,500 to £1,250,619.

MARSHALL SONS & COMPANY, LIMITED, makers of diesel wheel and crawler tractors, etc., of Gainsborough (Lincs)—The chairman, Mr. Arnold Carr, states that it was not until the last quarter of the year that business began to show much improvement but it was now looking forward to a better trading position. The steel-foundry side was enjoying an increasing demand. Group net profits amounted to £54,463 (£60,663) and the dividend is maintained at 5 per cent.

FLETCHER HOUSTON & COMPANY, LIMITED, iron-founders, of Tipton (Staffs)—The company has acquired the whole of the issued ordinary and preference share capital of Baxters (Bolts, Screws & Rivets), Limited, Birmingham, together with its wholly owned subsidiaries A.1. Screw Company, Limited, and Automatic Feed Machines Company, Limited. Consideration was £423,975 in cash. The company's own resources with some temporary assistance from the bank financed the acquisition.

COLTNESS IRON COMPANY, LIMITED, engineers, makers of Portland cement, limestone, and building bricks, etc., of Glasgow—Group profits declined to £105,318 (£134,519) and the dividend for the year to September 30, 1959, is reduced to 11¼ (12½) per cent. Following omission of an interim, there is a single dividend of 9d. per 6s. 8d. share, against the previous total of 10d. After reduced tax of £52,429 (£78,611), the net balance is £52,889 (£55,908), of which £14,309 (£16,858) is retained by subsidiaries.

CASTINGS, LIMITED—Neville Industrial Securities, Limited, announces a heavy demand for the placing of the ordinary shares of 2s. each at 3s. 1½d. The shares placed were made available only to members, who on January 25, 1960, were registered as holders of 50 or more ordinary shares in Neville Developments, Limited, as follows:—Applicants holding 100 ordinary shares or more in Neville Developments receive 80 ordinary shares in Castings, Limited, for every complete 100 ordinary shares held by them in Neville Developments; applicants holding 50 ordinary shares in Neville Developments participate in a ballot for allocations of 40 ordinary shares in Castings.

Head Wrightson's new Agreement

Under an agreement signed between Head Wrightson & Company, Limited, the Tees-side engineers, and the Belco division of the Bogue Electric Manufacturing Company, of Paterson, New Jersey, Head Wrightson will design, engineer, and build water-treatment and trade waste disposal plants throughout the world, excluding the North American continent. Mr. Edward P. Schinman is president of the Bogue Electric Manufacturing Company. Belco is well established in this field, and by merging the resources of the two companies it will be possible to offer industry the services of an organization with both outstanding design experience and manufacturing technique, especially in the field of fully automatic processes.

Some of the largest demineralization plants in the world at chemical plants, oil refineries, and at nuclear stations have been installed by the American company. The existing interests of the Tees-side company in these fields will permit it to expand the services it now offers.

The design and manufacture of this equipment will be handled by Head Wrightson Processes, Limited, which has moved to 20-24, Old Street, London, E.C.1. The headquarters of this company, which is also responsible for all Head Wrightson's nuclear research and nuclear power interests will be located at Yarm-on-Tees. Additionally the company will continue to supply the industrial cooling equipment and the specialized chemical plants not covered by McKee Head Wrightson, Limited.

Railway-wagon Makers plan Merger

A merger between two of Britain's biggest railway-wagon and carriage manufacturers is being negotiated. They are Charles Roberts & Company, Limited, Wakefield, and the Birmingham Railway Carriage & Wagon Company, Limited. The directors said in a joint statement that a further announcement would be made "in due course." The amalgamation would create a group with total assets of almost £10,000,000.

If you have a dust problem, we have an answer to it—an answer based on over 30 years' specialisation in industrial dust collection. During that time, we've settled pretty well every kind of industrial dust: metal, wood, plastic, food, chemical, and so on. We've done it with the help of up-to-the-minute scientific research and the widest range of equipment made in this country: filters, large and small unit collectors, wet collectors (particularly useful for fine or explosive dust), and complete plant installations. All our collectors are self-cleaning and are designed for either fully or semi-automatic operation.
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DALLOW LAMBERT & COMPANY LIMITED, THURMASTON, LEICESTER

CRC 83

Personal

Mr. W. R. TODD has been appointed to the board of Ferro Enamels, Limited.

Mr. C. W. KING has been appointed a director of S. Russell & Sons, Limited.

Mr. T. H. WOOD and Mr. C. B. DROVER have been appointed directors of Francis Shaw & Company, Limited, engineers, Manchester.

Mr. PETER WRIGHTSON, managing director of Head Wrightson & Company, Limited, since 1955, has been appointed vice-chairman and managing director.

Mr. K. M. EATON has been appointed general supply manager of Vauxhall Motors, Limited, from March 1, in succession to Mr. G. F. TIPPLER, who is retiring.

Mr. JOHN S. BYAM-GROUNDS has been appointed deputy managing director of B. & S. Massey, Limited, manufacturers of smithy and drop stamping plant, etc., Openshaw, Manchester.

Mr. E. L. TUFF has been appointed a director and deputy chairman of Peco Machinery Sales (Westminster), Limited, a subsidiary of the Projectile and Engineering Company, Limited.

This month, Mr. W. F. LIST, assistant managing director of C. C. Wakefield & Company, Limited, and of Wakefield-Dick Industrial Oils, Limited, completes 50 years with the Wakefield Castrol group.

Mr. WILLIAM C. BOLENIUS, executive vice-president of the American Telephone and Telegraph Company, New York, has been elected a director of the International Nickel Company of Canada, Limited.

Mr. JOSEPH SAMUELS, who, as a member of the board of Winston Electronics, Limited, Shepperton, Middlesex, has been purchasing director for several years, has now been appointed works director in charge of production.

Mr. J. C. PROUDFOOT, managing director of Ambrose Shardlow & Company, Limited, engineers, Meadowhall, Sheffield, presented Mr. W. M. RAMSEY with an automatic tea-making machine on February 19, to mark his completion of 50 years' service with the firm.

Mr. G. R. DUTTON, formerly an executive director, has been appointed to the main board of the Firth Company, Limited, Warrington, a member of the Firth Cleveland Group. He will continue to be in charge of the sales of the company's products.

Mr. RICHARD L. STONE, assistant electrical engineer, Hadfields, Limited, East Hecla Works, Sheffield, presented a tea-trolley and electric kettle to Mr. WILLIAM BUNTING on February 19 on behalf of his colleagues, to mark his retirement after 43 years' service with Hadfields.

Mr. WILFRID PADLEY has been appointed to the board of Metal Industries, Limited. He will relinquish his position as managing director of Brookhirst Igranic, Limited, an electrical subsidiary of the company, and will be succeeded in that post by Mr. A. B. VICKERY.

Mr. R. N. M. WARD, who has been with the Guest, Keen Iron & Steel Company, Limited, for over eight years, has joined the staff of the company's London manager, Mr. Victor Harvey. Mr. Ward's previous experience with the company was gained at Dowlais and Cardiff.

Mr. J. MACKENZIE-MAIR has been appointed to the board of the Steel, Peech & Tozer, branch of the United Steel Companies, Limited, and assumes the title of director and commercial manager. Mr. W. T. VIZER HARMER remains a full-time director of Steel, Peech & Tozer.

Mr. J. TINNEVELD, engineering director of Cockburns, Limited, valve makers, Glasgow, is making a business trip to various parts of South Africa, with a view to negotiating licence agreements for the manufacture of valves and also sales agencies.

Mr. R. WILD of the British Iron and Steel Research Association is to read a paper on "Consideration of Fuel Requirements for Iron-ore Reduction" before the International Conference on Direct Reduction, organized by the Electrochemical Society of the USA at Chicago from May 2 to 5.

Sir RICHARD YEABSLEY, who is chairman of Brown Bros., Limited, metal stockholders, etc., of London, E.C.2, and a director of Johnson & Phillips, Limited, manufacturing electrical engineers, etc., of London, S.E.7, and many other companies, has joined the board of Spicers, Limited, paper makers, and has been elected chairman.

Mr. ERIC MENSFORTH, of Sheffield, deputy chairman of John Brown & Company, Limited, and chairman of Firth Brown Tools, Limited, and Westland Aircraft, Limited, left on February 21 on a business trip to South America. He will be away till the end of March.

In recognition of his services to the company, Mr. J. McDOUGALL, shop steward for 25 years at the iron-founding firm of Arthur Green, Limited, Chesterfield, was presented with a watch by Mr. Hugh M. Sands, managing director, at the firm's annual dinner. Mr. McDougall is secretary of the Chesterfield branch of the Amalgamated Union of Foundry Workers.

Richard Thomas & Baldwins, Limited, announce the appointments of Mr. ROBERT H. PARKER as works manager, Mr. HENRY F. PADBURY as assistant works manager, Mr. RAYMOND RABY as coke-ovens manager, Mr. O. W. REYNOLDS as education and training officer, and Mr. SIMON I. WEBBER as assistant chief accountant, to the production and administrative staff of the Spencer steelworks now being built near Newport, Mon.

Mr. J. J. GRACIE, the Birmingham industrialist, has been made a Fellow of the City and Guilds of London Institute in recognition of his "professional status and achievement." Part of his education was at the City and Guilds (Engineering) College in London, and it is as an old student there that he qualifies for this award. He is a director of the General Electric Company, Limited, and general manager of the GEC works at Witton.

Mr. LESLIE F. CHAMBERLAIN, chairman of the Chamberlain Consolidated, Limited, group of companies which includes Chamberlain Industries, Limited, makers of cranes, excavators, bending machines, etc., of London, E.10, is to visit Trinidad to sound the market for manufacturing and marketing standard steel buildings in the Caribbean. He will be accompanied by Mr. M. H. Briggs, of Sanders & Forster, Limited, the structural engineering company in the group.

The British Transport Commission announce the appointment of Mr. E. W. ARKLE, at present director of traffic services in the London Midland Region of British Railways, as chief traffic officer, British Railways central staff, at Commission Headquarters. Mr. Arkle succeeds the late Mr. FRANK GRUNDY. It is also announced that Mr. A. E. FLAXMAN, commercial officer, British Railways, Western Region, has been appointed to succeed Mr. A. A. HARRISON, chief freight officer, British Railways central staff, who has been appointed assistant general manager, Eastern Region.

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News in Brief

THE ROTHERHAM WORKS of Steel, Peech & Tozer, Limited, were toured on February 17 by a party of Yugoslav local government officials on a visit to Sheffield.

ABRAFACT, LIMITED, makers of grinding wheels, Sheffield, have come to terms with Gainsborough Urban Council for the purchase of a site in Bridge Street opposite their present factory in the town.

A FURTHER CONTRACT valued at £2,000,000 for power plant and electrical equipment has been placed with the General Electric Company, Limited, by Colvilles, Limited. The plant and equipment is for extensions to the power-house at Colvilles' Ravenscraig Iron and Steel Works, near Motherwell.

OVER 100 DRAUGHTSMEN employed by Hadfields, Limited, and Millspaugh, Limited, Sheffield, returned to work on February 19 after being on strike since December 28 last year. They had claimed recognition of their union's minimum pay scales, together with the retention of existing differentials. A statement issued by the firm said that the resumption of work was to enable discussions to start.

SKLENAR FURNACES, LIMITED, 385, Newport Road, Cardiff, are to exhibit this year at the Hannover Trade Fair which is being held in Germany from April 24 to May 3. A range of Sklenar and Reverbale furnaces will be demonstrated on the stand which is being manned by staff from Cardiff in association with the company's German agents—Strico, P.O. Box No. 83, Gummersbach, Rhineland, Western Germany.

THE AMERICAN MARIETTA COMPANY, of Chicago, have acquired a minority holding in Wolstenholme Bronze Powders, Limited, of Sharples, Bolton. Mr. Don. O. Niel, president of the metals disintegrating division of the American company has joined the Wolstenholme board. This move has been made to strengthen the position in America of the Wolstenholme Bronze Powders Company, for whom the American Marietta Company have acted as agents during the past 10 years.

THE SECOND FURNACE at the works of the Wellingborough Iron Company, Limited, Northants, was ceremoniously lit last week, by Mr. C. P. Gunstone, assistant general manager, Corby iron and steel works. This additional furnace, which was built in 1934 and modernized in 1957, making it one of the best small furnaces in the country, will mean an increased production of 2,000 tons of pig-iron per week. A very efficient dust-extracting plant was put into operation later in the week.

THE RECIPROCAL SOCIAL SECURITY AGREEMENTS which the United Kingdom concluded last July and August with Finland and Denmark have been ratified and both will come into force on March 1. The agreements cover benefits provided by the schemes of National Insurance, Industrial Injuries Insurance and Family Allowances in this country and the corresponding benefits in Denmark and Finland. Details may be obtained from the Ministry of Pensions and National Insurance, Overseas Group, Newcastle-upon-Tyne.

"EXPORT DOCUMENTATION" was the subject of a talk by Mr. A. E. Kemp, a former national chairman of the Institute of Shipping and Forwarding Agents, to the West Riding branch of the Institute of Export at Bradford on February 17. He said it was important that export documents should be completed so that exporters would avoid fines, excess duty, or the impounding of goods when they reached their destination. He said he would like to see a reduction in the number of documents which had to be completed for even the smallest export.

EIGHT MEN WERE BURNED when 170 tons of molten steel escaped from a mould at the steel foundry of English Steel Corporation, Limited, on February 18. The mould in which the casting of a huge housing for a rolling mill was being made, collapsed when a ladle of liquid steel had been poured in. The mould broke up without warning and the contents cascaded over the floor. Three of the men were detained at Sheffield Royal Infirmary, the other five were treated for minor burns and allowed to go home.

AT THE LEIPZIG SPRING FAIR in Eastern Germany from February 28 to March 8, Mr. Anthony J. Cox, general manager of the Birmingham Engineering Centre, will be in charge of the information bureau, which, at the request of the Federation of British Industries, the Centre is organizing to deal with inquiries covering the whole field of British engineering. The Birmingham Engineering Centre has been invited by the Board of Trade to organize similar bureaux at the trade fairs at Poznon, in Poland, from June 12-26, and at Brno, Czechoslovakia, from September 11-25.

A NEW ORDER from Czechoslovakia for British Norton motor-cycles brings the total spent by the Czechs on these Birmingham-made machines within the last 12 months to £40,000. An initial £20,000 order for Norton ES2 single-cylinder 500 c.c. machines was followed by another for a further £10,000, and the third and latest order is also worth £10,000. By April of this year Czechoslovakia's central buying organization, the Motokov Foreign Trading Corporation, of Prague, will have bought nearly 300 Nortons —the first British machines to go into Czechoslovakia in any quantity for more than 10 years.

BRIGHTSIDE FOUNDRY AND ENGINEERING COMPANY, LIMITED, Sheffield, has received an order from the Brymbo Steel Works, Limited (a Guest, Keen & Nettlefold subsidiary), to manufacture and instal as main contractors, a 32-in. blooming mill. The mill is required in connection with the second development scheme at Brymbo Steel Works which provides for rolling capacity of up to 250,000 ingot tons a year, involving capital expenditure of over £2,000,000. This balances the steel-producing capacity installed under the first development scheme. The English Electric Company, Limited, are to supply the electrical equipment for the mill.

A RECOVERY IN IMPORTS of general goods into the Tyne was reported to the Tyne Improvement Commission on February 16 by its Docks and Trade Committee. The 1959 total of imports of 2,712,077 tons was an increase of 266,818 tons on the previous year. It is still below the 1957 total, which was 2,900,000 tons, and the 1956 record was nearly 3,700,000 tons. A recovery in the iron-ore trade and increased imports of petrol and oil were mainly responsible for the improved position. General exports were down by over 82,000 tons to 458,497 tons, chiefly because of a reduction of almost 100,000 tons in shipments of sulphate of ammonia.

THE METALLURGY DEPARTMENT of the Battersea College of Technology announce a refresher course on the "Structure of Metals and Alloys" to be held from April 5 to 8. The fee for the course is £12 12s. (inclusive of luncheon, mid-morning and mid-afternoon refreshment). Enrolment forms and further information may be obtained from the secretary (metallurgy courses), Battersea College of Technology, London, S.W.11. (As announced in the February 4 issue of

the JOURNAL, further courses to be held during the summer vacation are (July) "Developments in Foundry Practice" and (September) "Austenite Transformation—the Present Position.")

FOR TREATING Britain's motorways in severe winter conditions, the Ministry of Transport has bought seven specially designed bulk-gritting vehicles from Scammell Lorries, Limited, of Watford, which are capable of speeds up to 40 m.p.h. Designed to carry 13 to 14 tons of grit or salt, the four-axled gritter is fitted with mounting brackets at the strengthened front-end for the attachment of straight or "v" snow-plough blades. The new vehicles will have 12 forward speeds and 2 reverse speeds at hand, and also incorporated is a power take-off used for gritting. Power is provided by a 160 b.h.p. Leyland 0.680 diesel engine with hydraulically-operated clutch.

THOS. W. WARD, LIMITED, Sheffield, held their annual staff ball at the Cutlers' Hall, Sheffield, on February 19. The 900 guests included managers and representatives from all parts of the country. Mr. H. W. Secker (chairman) and Mrs. Secker, received the guests, who included Mr. and Mrs. P. J. C. Bovill (Master and Mistress Cutler); Mr. C. H. T. Williams (Senior Warden of the Cutlers' Company, and chairman of Park Gate Iron & Steel Company), and Mrs. Williams; Mr. and Mrs. S. Walker; Miss Mary Secker; Miss Helen Carr; Mr. Alan Sykes (secretary of the Cutlers' Company), and Mrs. Sykes; and Mr. and Mrs. M. Cockayne. A number of directors of Thos. Ward were also present including Mr. Arnold Carr, the deputy chairman.

WITH EFFECT FROM MARCH 1 the name of the N.C.K. Rapier Sales Company, Limited, is to be changed to NCK-Rapier, Limited. This company came into operation at the beginning of last year, concerned with the sales and servicing of the range of heavy-duty excavators and cranes produced by Newton Chambers and Company, Limited, of Thorncliffe, Sheffield, and their subsidiary, Ransomes and Rapier, Limited, of Ipswich. The address of the company is 32, Victoria Street, London, S.W.1. The chairman of NCK-Rapier, Limited, is Mr. P. J. C. Bovill, managing director of Newton Chambers, and among the other directors are Mr. S. C. Tyrrell and Admiral R. S. Warne (retd.), the joint managing directors of Ransomes and Rapier; the general manager is Mr. Ian S. Whiteman, formerly general sales manager of the excavator division of Newton Chambers.

BECAUSE OF THE SHORTAGE both of skilled engineers and draughtsmen a number of motor-vehicle component firms in the Midlands are considering expanding to areas of high unemployment to follow the example of the motor industry itself, it was stated at the meeting on February 16, in Birmingham, of the Midland Regional Board for Industry. At the Press conference following the meeting, Major C. R. Dibben, chairman of the Board, said that the upward trend in Midland industry was being well maintained, and it was the opinion of the Board that conditions would remain buoyant for some time. He mentioned that there might be some shift of emphasis from expansion in the consumer-goods industries to expansion on the heavier side of industry in which there was now definite signs of increased activity. When the expansion of the Midland motor industry to areas of high unemployment was discussed, Mr. P. J. L. Homan, regional controller of the Board of Trade, said "The Board's policy has now been fortified by some pretty heavy inducements for other firms to follow the industries with which they are linked."

FBI Inquiry Report

A picture of continued expansion and sustained optimism for the future is painted in the report of the seventh inquiry into industrial trends conducted by the Federation of British Industries. The report relates to the position at the beginning of February and is based on replies from 724 chairmen and managing directors of firms representative of British industry both in size and type. The main activity of 37 per cent. of these is in engineering, metals, shipbuilding, or electrical trades.

No less than 48 per cent. of the firms questioned felt more optimistic about the general business situation in the country than four months before when the last FBI inquiry was conducted. Only 3 per cent. felt less optimistic and the remaining 49 per cent. held the same views as before. Even so, a third of the firms found labour more difficult to get and only 7 per cent. reported an easing of the labour position. Slightly over half claimed to be working to capacity (the figure four months ago *was* 50 per cent.), but there remained 45 per cent. whose level of output was below capacity.

One outstanding feature of the inquiry was the upward trend in anticipated capital investment over the next year. In October, for the first time, the increase in future investment in plant and machinery outweighed the decreases and this trend has continued more strongly. The rising trend in capital investment intentions is confirmed by the replies to the question asking about orders received for capital equipment items.

Of the firms to which this question was relevant 48 per cent. reported an increase, 11 per cent. a decrease, and 40 per cent. no change. The upward balance here was nearly as marked as for new orders of all kinds.

Output trends, the rate of new orders, both home and export, and the length of order-books continue to rise more strongly than four months ago. Since then, 44 per cent. show an increase in the length of order-books, 13 per cent. a decrease, and 32 per cent. no change. In the case of 55 per cent. there was a rise in the rate of total new orders, but only 29 per cent. could say the same for new export orders. In this category, 44 per cent. reported no change, and 11 per cent. a drop.

More than half the firms questioned reported an increased level of output compared with four months previously, and 25 per cent. showed an increased level of export deliveries. In the case of 33 per cent. stocks of raw materials had risen: 20 per cent. showed an increase in stocks of finished goods, but 24 per cent. reported a decrease in this category.

Aluminium Research Scholarship planned

A research scholarship in the application of aluminium in mechanical engineering is to be awarded this year by the Council of the Institution of Mechanical Engineers, provided there are suitable candidates. The scholarship, which is being given by the Aluminium Development Association, is worth £650 a year and will be tenable for two years with the possibility of a third-year extension.

Candidates, who must be British-born subjects, should normally be at least 23 years old, and must have obtained an approved engineering degree or have satisfied the Institution's examination requirements for graduate membership by some other means. They should preferably have had at least 18 months' practical training in works. Application forms may be obtained from the secretary of the Institution, 1, Birdcage Walk, London, S.W.1. Completed application forms should be returned by May 11.

British Standards Institution

Malleable-iron Detachable-link Chains

A draft standard prepared by the British Standards Institution concerns malleable-iron detachable-link chains for agricultural and industrial machines. The standard aims at reducing the range of sizes of "square-link" detachable chains and at overcoming difficulties of replacement, occasioned by the slight dimensional variations in chains of similar nominal size made by different makers. The draft covers a range of pitches from just under 1 in. to just over 4 in. and specifies the quality of material (normally to BS 309 to BS 310 as the minimum) and the strength requirements of the finished chain. Only dimensions essential for the interchangeability of the finished chain and sprocket wheels have been specified; for various reasons standard tolerances on individual links were found to be impracticable. A chain numbering system is set out. Later a specification for attachment links and sprocket wheels will be added to the basic standard. The closing date for comment on the present draft is February 29. Copies are obtainable from the BSI at 2, Park Street, London, W.1.

Tests for Galvanized Coatings

It is reported that a panel of the BSI committee, CHE/18/6, has under consideration a draft standard for hot-dip galvanized and sherardized coatings on articles other than wire, which is intended to make proper provision for the testing of coatings on grey-iron and malleable-iron coatings.

Large-scale Plant for Machining Beryllium

New plant for machining beryllium, the first large-scale works of its kind in the country and possibly in Europe was opened in Coventry this week by Sir W. G. Armstrong Whitworth Aircraft, Limited, a member of the Hawker Siddeley Group, Limited. Beryllium has been chosen as a canning material for fuel elements in a new advanced gas-cooled reactor at Windscale and the plant will produce components for the latest type of nuclear reactors.

Elaborate measures have been taken against the hazards of beryllium dust and Mr. Robert Courtman, chairman of the company's projects committee, states that it has been found necessary to spend about £3 on employee protection for £1 on normal manufacturing facilities.

SCOW to instal Continuous-casting Plant

The continuous casting plant to be installed by the Steel Company of Wales, Limited, as part of its development programme, will be the largest of its type outside the USSR. A twin-strand unit, it will produce slabs from 27 in. by 6 in. to 48 in. by 9 in. and up to 21 ft. in length from basic-Bessemer steel.

The well-known BISRA process will be used and the plant will be supplied by Continuous Casting Company, Limited, Weybridge (Surrey), licensee for the BISRA continuous casting processes. The company is an associate of Campbell, Gifford & Morton, Limited, Davy & United Engineering Company, Limited, and Newton, Chambers & Company, Limited.

FRANCIS SHAW & COMPANY, LIMITED—Mr. T. H. Wood and Mr. C. B. Drover have been appointed directors.

BAKER PERKINS FOUNDRY TEAM

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The photograph below shows one of eight matched Baker Perkins units chosen to provide all the mixing requirements for an automotive grey iron foundry in the U.S.A. A strong line of five B-P (150 tons per hour) 5A Continuous Moulding Sand Mullers delivers consistently uniform sand into the moulding shop.
Behind them a B-P Core Paste Mixer and a B-P Core Wash Mixer ensure excellent core surfaces. Centre of the team is the B-P Refractory Clay Mixer for lining ladles and cupolas.
After four years of gruelling operation this B-P equipment has proved itself in all respects. It is built to do a rugged job consistently and with minimum maintenance.

For further details of this and other foundry machinery write to:

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BPF9

Raw Material Markets

Iron and Steel

Substantial increases have been made and continue to be made in the production of most grades of pig-iron to satisfy the expansion in consumption. With the rising outputs of ingot steel, the demands from the steelworks for basic pig-iron are on a rising scale. The furnaces producing this grade of pig-iron are able to satisfy these requirements and increased productive capacity is available to meet a bigger call for supplies should this be found necessary.

The demand for supplies of pig-iron from the iron-foundries is also increasing. Substantial tonnages of the low-phosphorus irons continue to be called for and producers generally are fully committed for their outputs.

Some brands of this grade of pig-iron are still limited in supply, but alternative irons in similar analyses can be secured to make up the shortage. Increased production is also being obtained from the furnaces recently burdened for this iron and additional capacity will be available shortly which will step up supplies.

Makers of hematite pig-iron are very busy in meeting the increased demands for supplies from both the steelworks and the foundries and their current outputs are fully absorbed. Refined-iron makers are also well occupied. Although, comparatively, the usage of the high-phosphorus pig-iron is not so heavy as that of other grades of foundry pig-irons, producers are able to dispose of the major portion of their outputs to meet the demands from home users and also overseas orders. Stocks of pig-iron in all grades at the furnaces are now much lower than they have been for some time past and with the amount of work on hand and to ensure adequacy of supplies there is now more forward buying by the foundries, particularly for the low-phosphorus irons and hematite.

The engineering and speciality foundries maintain a high level of production of high-duty castings and, apart from those supplying mainly to collieries and railways, orders coming to hand should ensure maximum outputs for some time ahead. The motor vehicle trade continues to indent heavily for castings, and from many other users of high-duty castings, including machine-tool makers, and steelworks, demands are on the increase. Many of the light foundries, though well employed, could undertake more business, as could also the jobbing and textile foundries, although they are now busier than they were.

There is a strong demand from the foundries for iron and steel scrap, particularly for heavy cast-iron and machinery scrap, which is scarce. Parcels arising are readily accepted. Foundry coke deliveries are satisfactory and ganister, limestone, and firebricks are easily obtainable.

Pressure from the re-rollers for supplies of steel semis is maintained, particularly for small-sized billets which are required for production of small bars and light sections, the call for which shows no diminution and the re-rollers are covered for their outputs for some months ahead. The re-rollers of reinforcing rods also have heavy order-books.

Home steelworks are sending forward all available supplies of billets, blooms, etc., but these go into current production as stocks at the re-rollers are small and in some instances outputs are retarded due to scarcity of steel. All arisings at the steelworks of suitable re-rolling defectives and crops are readily accepted.

Non-ferrous Metals

The copper market in London has turned weak. This is not surprising. The US copper industry is getting back into its stride quickly and the various peace settlements in January enabled the industry to produce 60,061 tons, compared with the December level of 21,686 tons. The only units still strike-bound are the Laurel Hill refinery and the White Pine Copper Company and the forecast is that a return to work will be effected shortly. Moreover, demand for copper in the US is not as brisk as expected and, with other copper-producing centres in the world expanding their production, the outlook is for production to outrun consumption in the near future.

On top of these bearish influences there was an unexpectedly large rise of the copper stocks in LME warehouses last week by 650 tons to 4,122 tons and this seemed to be the one point that delivered the *coup de grâce* to the London price structure. Indeed, at the beginning of this week the cash price dropped £11 to approximately £252 a ton and the premium over three months' metal closed to £9 12s. 6d. a ton, which compares with a backwardation of £31 a ton at one time the previous week.

At present US producers are selling at 33 cents and custom smelters at 35 cents a pound, although there are a few transactions being effected at a premium of about 2 cents a pound for prompt metal in dealers' hands. In these circumstances, consumers are reluctant to enter the market and the outlook must remain somewhat blurred until price levels more nearly approximate to the true supply and demand position.

Tin is steady in London, with the price fluctuating narrowly around £791 a ton. In New York the market is good and the price has been higher than $1.02 a pound, although it is fractionally below that level at present. In Singapore demand is slightly patchy, though, on the whole, good with offerings being well absorbed.

Lead has been a good market in London and prices have risen gradually to around £75 a ton. There would appear to be a fairly strong element of speculation in the recent price rise, with dealers going on the assumption that the price of the metal is too low in relation to that of zinc. In New York the market is quietly steady and the price is still called 12 cents a pound.

Zinc has been a relatively weak and definitely sensitive market in London, due to increased supplies coming on to the market from the Continent which has helped to generate the belief that the days of chronic shortages have temporarily ended. This has brought the price down to around £87 a ton in London. The US market is steady to good for both "Prime Western" and special high grades and the price is firm at 13 cents a pound.

Fuel Efficiency & Power for Industry Exhibition

In connection with the Fuel Efficiency and Power for Industry Exhibition, which is to be held in the Grand Hall, Olympia, London, from April 27 to May 6, there is to be a series of technical meetings arranged through the Institute of Fuel. These are to be held in the Conference Hall and cover such subjects as heat-transfer, -losses and -recovery. Preprints of the papers can be obtained at the cost of 9d. for postage, etc., from the secretary of the Institute of Fuel, 18, Devonshire Street, Portland Place, London, W.1, marking the envelope—"Olympia." About 125 firms have taken space at the Exhibition, and of these about 20 furnish plant and materials to the foundry industry.

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EXTREME RESISTANCE TO ABRASION
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(up to 1,150/1,200°C.)

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AP91

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

February 24, 1960

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 10s. 0d. to £44 0s. 0d., scale 15s. 0d. per unit, lumpy; 75 per cent. Si, £57 0s. 0d. to £62 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 12s. 0d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 15s. 0d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £78 10s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £77 0s. 0d. to £80 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent, C,* 1s. 8½d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C,* 1s. 9¾d. to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 10¼d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £275 0s. 0d.; 96/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £63 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

* Average 68–70 per cent.

FINISHED STEEL

Heavy Plates and Sections (1 ton to 10 tons).—Ship plates, (N.-E. Coast), £41 12s. 0d.; boiler plates (N.-E. Coast), £44 2s. 0d.; floor plates (N.-E. Coast), £43 10s. 0d.; angles (N.-E. Coast), £38 16s. 6d.; joists (N.-E. Coast), £38 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d., nickel-chrome, £99 4s. 0d.; nickel-chrome-molybdenum, £111 17s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £252 0s. 0d. to £253 0s. 0d.; three months, £240 15s. 0d. to £241 0s. 0d.; settlement, £267 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 6½d. per lb.; rods, 287s. 6d. per cwt. basis; 20 s.w.g., 322s. 6d per cwt.

Tin.—Cash, £790 10s. 0d. to £791 10s. 0d.; three months £789 0s. 0d. to £789 10s. 0d.; settlement, £791 10s. 0d.

Lead (Refined Pig).—Second half February, £75 0s. 0d. to £75 2s. 6d.; second half May, £74 5s. 0d. to £74 7s. 6d.

Zinc.—Second half February, £87 10s. 0d. to £87 12s. 6d.; second half May, £87 12s. 6d. to £87 15s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £122 10s. 0d.; rolled zinc (boiler plates), all English destinations, £120 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £102 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 1¼d. per lb.; sheets to 10 w.g., 225s. 3d. per cwt.; wire, 2s. 10½d.; rolled metal, 225s. 3d. per cwt.

Brass (Brazing).—BS1400, B3, £163; B6, £218.

Brass (High Tensile).—BS1400, HTB1, £199; HTB2, £216; HTB3, £229.

Gunmetal.—BS1400, LG2, £206; LG3, £215; G1, 1%, £273; G1, 1%, £261.

Phosphor Bronze.—BS1400, PB1 (AID released), £307; BS1400, 90/10/1, £290.

Leaded Phosphor Bronze.—BS1400, LPB1, £227.

Phosphor Bronze Strip, etc.—Strip, 322s. 9d. per cwt.; wire, 4s. 5d. per lb.; rods, 3s. 7½d.; tubes, 3s. 7½d.; chill cast bars; solids 3s. 7d.; cored 3s. 8d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11¾d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 3¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 0d. to 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £70 15s. 0d. to £71 5s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £257; AB2, £267.

Obituary

The death is reported of Mr. M. J. HEALY, manager of the foundry division of the Ford Motor Company, Limited, Dagenham.

The death occurred on Saturday, February 13, of Mr. R. C. SIMPSON, publicity manager of Newman, Hender & Company, Limited, ironfounders, Stroud, Glos.

Mr. BARON TURNER, managing director of Pickford Holland & Company, Limited, refractory-goods manufacturers, Fulwood Road, Sheffield, has died at the age of 47.

The death is announced of Mr. MAX RAMAEKERS whose interesting foundry, SA Fonderies Moens & Company, at Zelem, Belgium, was visited by a London group of foundrymen shortly after the second world war. He was a senator of the Belgian Parliament, and a prominent member of the Belgian employers' federation—*Fabrimetal*.

Mr. JOHN OLDFIELD CRABTREE, who has died at the age of 46, was a leading figure in the printing-press industry. He joined his father's firm, R. W. Crabtree & Sons, Limited, Leeds, in 1932. After passing through all the departments of the works he spent some time in the drawing office before moving to the sales side of the business. He became a director in 1936. He was recalled from military service in the last war to take charge of R. Hoe & Company, and later, R. Hoe & Crabtree, Limited. In 1948 he became vice-chairman of R. W. Crabtree & Sons, Limited. Mr. Crabtree remained with his father's firm until 1957, when he resigned to inaugurate a business, J. O. C. Engineers, Limited, building a different type of printing machine.

Triplex Foundry proposes Rights Issue

A rights issue of 800,000 ordinary shares of 5s. at 10s. per share in the proportion of one-for-one to those on the register on February 1 is proposed by Triplex Foundry, Limited. Any dividends declared for the year to March 31, 1960, will be outside the scope of these new shares.

The directors expect that profits before tax for that year will be not less than £150,000 and they expect to recommend a further dividend of 7½ per cent., making 12½ per cent. for the year. A total of 7½ per cent. was paid for the year to March 31, 1959.

For the year ending March 31, 1961, a full year's profit will be included from the newly-acquired subsidiary, Vowles Bros., Limited. There will also be a large saving in interest charges and the directors state it is reasonable to expect an appreciable increase in the group's profits if the present rate of profit earning of all sections is maintained. The directors would, in this event, feel justified in recommending a dividend for that year of not less than 12½ per cent. on the ordinary share capital as increased by the rights issue.

Recent Wills

ROBINSON, WILLIAM, founder of W. Robinson & Company, Limited, motor-body builders, of Wolverhampton £57,696

BEAUMONT, L. M., chairman and managing director of Leonard Cooper, Limited, structural engineers, of Hunslet, Leeds £24,905

DAKIN, R. B., joint managing director and deputy chairman of Walter Somers, Limited, manufacturers of heavy steel forgings, etc., of Halesowen, near Birmingham £27,228

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FOUNDRY MACHINERY

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PREPAID RATES: Fifteen words for 7/6 (minimum charge) and 4d. per word thereafter. Box Numbers 2/6 extra (including postage of replies). Situations wanted 2d. per word throughout.

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

YOUNG MAN (30), well educated, Diploma National Foundry College, seeks position as Assistant to Foundry Manager or similar. London or Home Counties.—Box YM418, FOUNDRY TRADE JOURNAL.

30 YEAR old ex-foundry Manager now engaged on sales seeks opportunity with progressive company. Capital available. Box TY421, FOUNDRY TRADE JOURNAL.

YOUNG MAN (31) well educated and Metallurgically Trained. Wishes any position with prospects home or abroad. Box YM431, FOUNDRY TRADE JOURNAL.

SALES EXECUTIVE requires Managerial appointment. Wide experience selling and administration. Box RD429, FOUNDRY TRADE JOURNAL.

FORMER CHIEF DRAUGHTSMAN for one of the largest foundry mechanisation firms in England offers his experience and capabilities for advising or full-time executive capacity. Box FC411, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE with extensive connection in London & Home Counties with large industrial groups wishes to represent a Foundry for cast iron non-ferrous die-castings, etc. Personal connection, commission and expenses. Box TR405, FOUNDRY TRADE JOURNAL.

ADVERTISER, 44, desires change. Manager or Assistant Manager. Eleven years managerial experience in ironfoundry producing castings up to 40 tons. M.I.B.F. Box AD406, FOUNDRY TRADE JOURNAL.

PRACTICAL FOUNDRYMAN, age 39, M.I.B.F., C. & G., returning U.K. April, seeks post, MANAGER/ASSISTANT MANAGER. Wide experience grey iron and non-ferrous castings. Fourteen years' executive experience U.K. and overseas. Excellent references. Box PF404, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

METALLURGIST required to take charge of small Physical and Chemical Laboratory, principally engaged on Aluminium Alloys but some Steel Heat-Treatment control experience preferable. A.I.D. approved would be an added advantage. Excellent conditions and scope, aged 25-40. Please write stating salary required and giving full details of experience to the WORKS MANAGER, Wellworthy Ltd., Ampress Works, Lymington, Hants.

FOUNDRY SUPERVISOR required for foundry in Walsall, Staffs, producing white heart malleable and grey iron; now adding non-ferrous, and expanding generally. Applicant should be between 27-35 years, and have held similar position. Membership of Institute, qualifications in foundry practice, work study, etc., an advantage. Basic salary and output bonus for man of initiative. Box FS423, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

FOUNDRY TECHNICIAN required to assist Manager of a 60-ton per week Grey Iron Foundry. Interesting and varied work with good prospects. Send details of education, experience, age and salary required to Box FT402, FOUNDRY TRADE JOURNAL.

NON-FERROUS Foundry specialising in copper based and aluminium alloys, sand and gravity, require FOUNDRY MANAGER. Splendid opportunity for capable man able to take control and improve quality and production. Midlands area. Box NF421, FOUNDRY TRADE JOURNAL.

SMALL well-equipped Iron Foundry situated in pleasant Derbyshire district require first class MOULDER who would be interested in becoming partner or later with view to purchasing same. Box SW430, FOUNDRY TRADE JOURNAL.

METALLURGIST required by a production grey Ironfoundry in West Midlands. Applicants should have sound experience in metallurgical control of cupolas and sand analysis. Reply stating age, experience and salary required. Box MR434, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN, 24, seeks position with good prospects, technical or production. National Foundry College Diploma, time-served patternmaker with excellent all-round Foundry training in cast iron and non-ferrous jobbing. London or Home Counties. Box FT433, FOUNDRY TRADE JOURNAL.

APPLICATIONS are invited for the position of FOUNDRY SUPERINTENDENT with a leading North Midlands Engineering Company. Applicants should have a first-class technical ability and practical knowledge of all aspects of High Grade Iron Foundry production. Initiative and executive ability essential. Superannuation scheme available and assistance will be given with housing. Excellent prospects for the right man but only first-class foundrymen with good knowledge of Shop Management should apply. —Box AA394, FOUNDRY TRADE JOURNAL.

STEEL
FOUNDRY MANAGER

BROWN, LENOX & CO. LTD., require a MANAGER for their Steel Foundry at Pontypridd.

Applicants must be experienced in the manufacture of Carbon and Medium Alloy Steel Castings up to 3 tons in weight, and in all aspects of foundry management.

Age 40-45. Pension Scheme. House Available.

Apply with full particulars to the Managing Director,

BROWN, LENOX & CO. LTD., Pontypridd, Glamorgan.

SITUATIONS VACANT—*contd.*

HAND MOULDER required for small jobbing foundry. Experience of non-ferrous metals essential. Good wages and conditions. Apply to PERSONNEL DEPARTMENT, E.M.I. Ltd., Blyth Road, Hayes, Middx.

IRON FOUNDRY with much development work ahead requires PRODUCTION SUPERINTENDENT. Main consideration is ability to lead foremen and operators to achievement of programme within time standard and at low scrap level. Experience on semi-mechanised layouts and with carbon dioxide process a definite advantage. Early advancement probable. Permanent staff appointment. Pension Scheme, etc. Apply in strict confidence to Box IF410, FOUNDRY TRADE JOURNAL.

FOUNDRY SUPERINTENDENT. Applications are invited from men capable of filling this vacancy in modern foundry, situated in Black Country, producing grey iron castings up to 1 ton in greensand and CO_2 on floor, bench and machine sections. Must have all-round experience, including practical knowledge of sand and metal control, and capable of directing all operations on shop floor. This is a responsible position carrying high salary and participation in non-contributory pension scheme. Please send full particulars of previous experience. Box FS420, FOUNDRY TRADE JOURNAL.

AN EXPANDING organisation in design and manufacture based on foundry mechanisation and equipment seeks the services of experienced DESIGNER - DRAUGHTSMEN and/or PROJECT ENGINEERS, to assist in interesting new developments. Midlands area. Attractive salaries to suitable applicants. Apply Box AE426, FOUNDRY TRADE JOURNAL.

METHODS SPECIALIST: Methods Specialist required for large Iron Foundry in West of Scotland (Glasgow area). Applicants should be aged 24/35 and possess a good practical and technical background. There are excellent prospects for a person of initiative. Staff conditions, excellent canteen and good travelling facilities. Apply Box MS424, FOUNDRY TRADE JOURNAL.

ASSISTANT STEEL FOUNDRY MANAGER: Assistant Steel Foundry Manager required for Foundry in Glasgow area. This position calls for a man of initiative with extensive experience in all aspects of modern steel foundry practice. Applicants should state age, qualifications and experience. Excellent canteen and good travelling facilities. Apply Box AS425, FOUNDRY TRADE JOURNAL.

FETTLING SHOP FOREMAN

FOR Henry Wallwork & Co., Ltd., Ironfounders specializing in high quality repetition castings.

Initial remuneration about £900 p.a. Staff appointment with Pension Scheme and other benefits. Will control a department of about 30 employees and should have experience of shot blasting, grinding and fettling iron castings up to 40 lbs. in weight in quantity production.

Apply to: THE SECRETARY,
HENRY WALLWORK & CO., LTD.
Roger Street, Red Bank, Manchester 4

SITUATIONS VACANT—*contd.*

PATTERN MAKERS, Wood and Metal. Master Shop experience. Good prospects and conditions; top rates. West London area. Box PM399, FOUNDRY TRADE JOURNAL.

PRACTICAL FOUNDRY MANAGER required for Grey Iron Jobbing Foundry in North Manchester area. Weekly production 6 tons. State age and experience. Box PF369, FOUNDRY TRADE JOURNAL.

ROUTINE ANALYST, age 40/45, required for analysis of cast iron, steel and non-ferrous metals. Knowledge of foundry materials preferred. Capable of working without supervision. Manchester area. Good salary. Pension Scheme, canteen. Box RA401, FOUNDRY TRADE JOURNAL.

FOREMAN REQUIRED to take charge of shop production of General Iron Foundry in Manchester. Experience of floor moulded castings up to 15 tons essential. Duties will include the supervision and training of apprentices. A salary of £1,000 plus non-contributory pension scheme. Age preferably over 40. Apply in confidence, giving full details. Box FC412, FOUNDRY TRADE JOURNAL.

ADELAIDE, SOUTH AUSTRALIA
FOUNDRY FLUXES & SUPPLIES
LARGE, expanding Wholesale Merchants in Adelaide have vacancy for a married man, age 28 to 35, in their Foundry Supplies Dept.
Experience with wholesale merchants in buying, stock control and in the organisation of selling is required. Experience in a foundry is not sufficient.
Apply for further information, quoting reference "FOUNDRY," to DAVIS & SOPER, LTD., 52 & 54, St. Mary Axe, London, E.C.3.

SENIOR FOUNDRY METALLURGIST required. Sound experience in High Duty Irons and Cupola control essential. Must also have practical experience in Sand Control and production of White Heart Malleable. Knowledge of Aluminium, Copper and Yellow Metals would be an advantage. Experience in A.I.D. requirements would also be in applicant's favour. Reply, in confidence, by letter only, stating age, experience and salary required, to: ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED, Hill Top Foundry, Smith Road, Wednesbury, Staffs.

FOUNDRY MANAGER

The services of a suitably qualified person are required for the position of Foundry Manager. Applicants must have full knowledge of the production of carbon and alloy steel, iron and non-ferrous castings and ancillary operations. Experience in the operation of electric arc melting furnaces essential. Applications, stating age and full details of qualifications, etc., should be sent to:—

Secretary,
DEALGAN STEEL FOUNDERS LTD.,
DUNDALK, IRELAND.

BUSINESS OPPORTUNITIES

30 YEAR old ex-foundry Manager now engaged on sales seeks opportunity with progressive company. Capital available. Box TY422, FOUNDRY TRADE JOURNAL.

AGENT based on Birmingham, would like to contact non-ferrous foundries desirous of obtaining work. Please reply stating type of casting, prices, capacity available and terms offered. Manufacturers in the Birmingham Area preferred. Box AB432, FOUNDRY TRADE JOURNAL.

AGENCIES

SMALL iron foundry, grey iron, wishing to expand, requires agent to sell on commission basis.—Full particulars to Box SM395, FOUNDRY TRADE JOURNAL.

REPRESENTATIVES REQUIRED

LIVE AGENTS required in Manchester, Liverpool, Newcastle, Durham, North Midlands, East Midlands, London and South Wales, calling on Foundries, Boiler Houses, etc., to sell Refractories. Right men can earn over £2,500 per annum. Write to: CORROSION LIMITED, Malvern Road, Southampton.

PATTERN MAKERS require REPRESENTATIVE on a commission basis. Apply in writing, giving details of experience and area covered, together with names of Agencies held, if any, to: THE SECRETARY, "Formit" Patterns, Limited, No. 7, South Road, Hockley, Birmingham, 19.

AGENTS, calling on Die Foundries, required to sell new and revolutionary die coatings and die machine lubricants, on commission basis. Write, stating area and coverage, to Box AC427, FOUNDRY TRADE JOURNAL.

SCOTTISH FIRM well introduced to Contractors, Local Government Departments, Water Boards, etc., in Scotland, are open to represent Iron Founders, who are able to offer really competitive prices in Road Castings. Storage and Warehouse facilities available. Box SF428, FOUNDRY TRADE JOURNAL.

BUSINESS FOR SALE

ADVERTISER approaching retirement, owner of small Ironfoundry near Manchester, old established with excellent profit record, invites offers of purchase or other suggestions. Replies will be treated in strict confidence. Box AA380, FOUNDRY TRADE JOURNAL.

MACHINERY WANTED

HIGH FREQUENCY Furnace, approximately 20 lbs. steel capacity; generating equipment not required. DAVID BUDWORTH, LTD., Harwich, Essex.

FORCED Air Circulation Furnace, 20-40 kW., 3 phase, 50 cycles, also Electric Salt Bath Furnace, 60 kW., 1,200 deg. C. Box FA395, FOUNDRY TRADE JOURNAL.

WANTED.—New or secondhand 2 ton Geared Foundry Ladle. Also 5 to 7 cwt. ladles on wheels. Messenger Co. Ltd., Loughborough.

SAND RECONDITIONING Plant required, capable of handling in the region of 30 Tons per hour; or would be interested in purchasing separate Units, *i.e.*, Sand Mill Vibratory Knockout, Magnetic Separtors, Belting, etc. The plant offered must be in first class condition and full details, including price required, must be given. Box SR408, FOUNDRY TRADE JOURNAL.

MACHINERY FOR SALE

PAN MILLS, 4 ft. and 5 ft. dia. underdriven, stationary pans, self-discharging, new, for delivery from stock. W. & A. E. BREALEY (MACHINERY) LTD., Misterton, nr. Doncaster. Tel.: Misterton 202.

SHOTBLAST PLANT: Tilghman Multi Rotary Table TS4, complete with all electric motors, electric control and dust extractor. Excellent condition. Low price for quick sale. Apply Box SP407, FOUNDRY TRADE JOURNAL.

SAND MIXERS and DISINTEGRATORS for Foundry and Quarry; capacities from 10 cwts. to 10 tons per hr.—W. & A. E. BREALEY (MACHINERY), LTD., Misterton, nr. Doncaster. Tel.: Misterton 202.

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3-3 PHASE 50 CYCLES

RATING kVA	MAKER	VOLTS
1,250	B.T.H.	11,000– 440
750	M/VICK	3,300– 415
750	M/VICK	6,600– 415
750	BRYCE	11,000– 400
400	L/THOMPSON	6,600– 400
400	E.E.C.	11,000– 400
400	L/THOMPSON	12,000–3,300
350	G.E.C.	11,000– 400
350	G.E.C.	11,000– 400

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EIGHT—MATHEWS & YATES "Cyclone" paddle blade fans, size PB8, duty 2,000/8,000 c.f.m., 1 in./7 in. water gauge.
THREE—KEITH BLACKMAN high efficiency blowers, type 7, capacity 120 c.f.m., 18 in. water gauge.
STURTEVANT Monogram fan, size No. 6, 2,040/6,950 c.f.m., 2 in./5 in. water gauge.

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MACHINERY FOR SALE—*contd.*

Roper LADLES
STOCK UP TO 5TON CAP.
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KEIGHLEY · Phone: 4215-6

FOR SALE.—10 cwt. Cupolette by Jackman, complete with starter, motor, fan and charging platform, also four hundred (400) new firebricks.—Apply CHRISTY & NORRIS, LTD., Chelmsford, Essex.

FOR SALE.—One Pneulec 1,500-lb. Jolt Rollover and Pattern Draw Moulding Machine. Table 60 in. × 48 in., with Control Pillar. Valves, Connections and Roller Run Off Tables. Please reply Box FS409, FOUNDRY TRADE JOURNAL.

SPECIAL OFFER—
THE FOLLOWING PRACTICALLY NEW EQUIPMENT FOR SALE AT BARGAIN PRICES.

Sterling 6ft. by 4ft. Knock-out Machine.
Pneulec 2-tons capacity Balanced Blast Cupola.
Sand Mill 3ft. 6in. dia. Motorized.
Two Spermolin Sand Mixers, motorized, A.C., 3-phase.
Two Pneulec Royers, Size No. 1.
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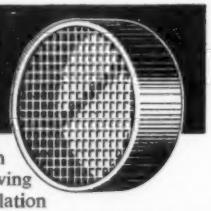

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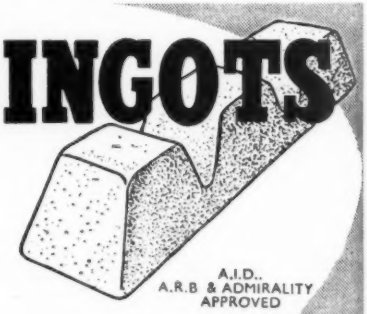

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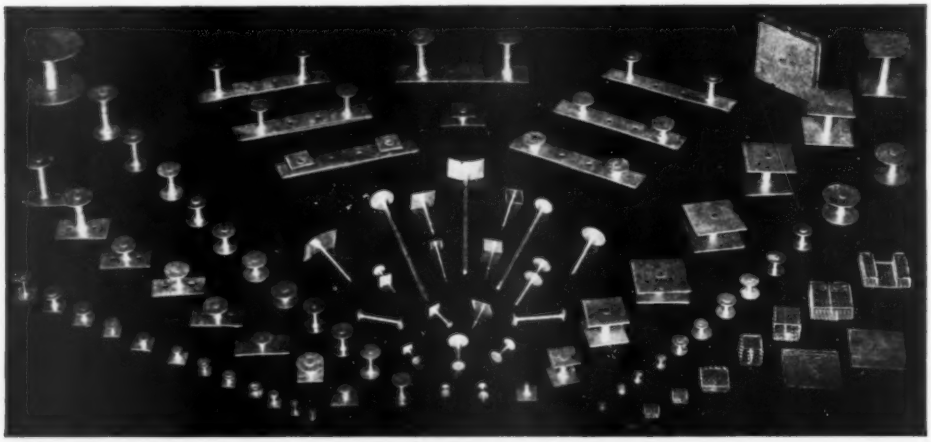

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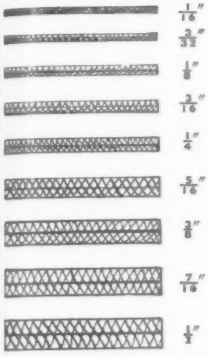

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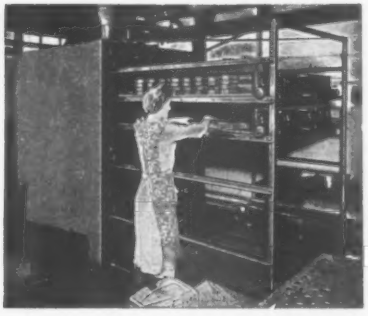

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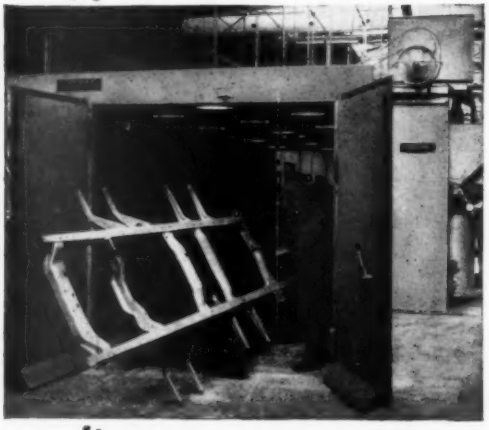

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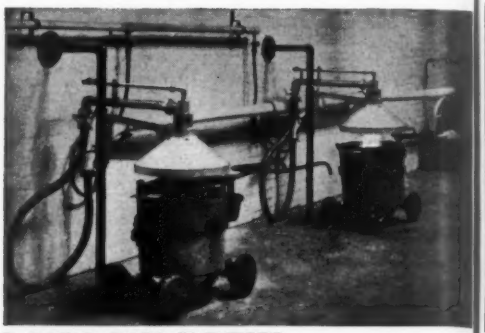

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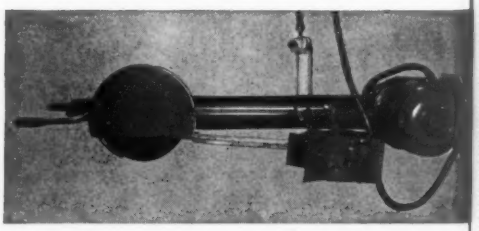

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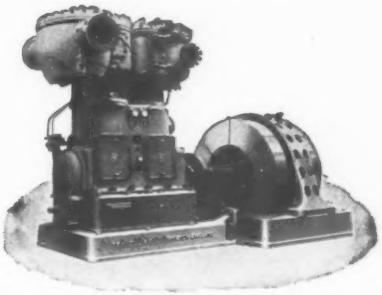

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Alley & MacLellan (Polmadie), Ltd.	—
Anderson-Grice Co., Ltd.	32
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Ass. Lead Mfrs., Ltd.	—
Association of Light Alloy Refiners, Ltd.	—
August's, Ltd.	44
Austin, E., & Sons, Ltd.	—
Badische Maschinenfabrik A.-G.	—
Bairds & Scottish Steel, Ltd.	—
Baker Perkins, Ltd.	255
Ballard, F. J., & Co., Ltd.	55
Ballinger, L. J. H., Ltd.	56
Beck, H., & Son, Ltd.	48
Bellias & Morcom, Ltd.	—
Berk, F. W., & Co., Ltd.	—
Bilston Shot & Grit Co., Ltd.	—
Bilston Stove & Steel Truck Co., Ltd.	52
Birkett, F. W., & Co., Ltd.	—
Birlec-Efco (Melting), Ltd.	26
Birlec, Ltd.	—
B.K.L. Alloys, Ltd.	—
Black & Decker, Ltd.	—
Blackwell's Metallurgical Works, Ltd.	—
Block & Anderson, Ltd.	—
Bloomer-Holt, Ltd.	—
Boydell, E., & Co., Ltd.	19
Bradbury, John, & Co. (Stockport), Ltd.	—
Bradley & Foster, Ltd.	—
British Acheson Electrodes, Ltd.	—
British Aero Components Ld.	—
British Electrical Repairs, Ltd.	—
British Foundry Units, Ltd.	42
British Industrial Sand Ltd.	—
British Iron & Steel Federation	—
British MonoRail, Ltd.	29
British Moulding Machine Co., Ltd.	38 & 39
British Oxygen Co., Ltd.	—
British Ronceray, Ltd.	—
British Shotblast & Engineering Co., Ltd.	—
Broadwell Engineering, Ltd.	—
Broom & Wade, Ltd.	—
Buckland Sand & Silica Co., Ltd.	—
Burn, John, & Co. (B'ham), Ltd.	49
Busby Bros., Ltd.	—
Carborundum Co., Ltd.	—
Catalin, Ltd.	—
Cawood Wharton & Co., Ltd.	57
Chapman & Smith, Ltd.	—
Ciba (A.R.L.), Ltd.	—
City Casting & Metal Co., Ltd.	52
Clayton Crane & Hoist Co.Ld.	—
Cohen, Geo., Sons & Co., Ltd.	—
Coleman-Wallwork Co., Ltd.	7
Combustion Chemicals, Ltd.	—
Constructional Engineering Co., Ltd., The	—
Controlled Heat & Air, Ltd.	—
Cooke, Bailey, Ltd.	—
Cox & Danks, Ltd.	—
Crockett Lowe, Ltd.	—
Cumming, Wm., & Co., Ltd.	57
Cupodel, Ltd.	—
Dallow Lambert & Co., Ltd.	249
Derby & Co., Ltd.	—
Distillers Co., Ltd., The	—
Dowler, H. J., Engineers & Pattern Makers, Ltd.	—
Dowson & Mason, Ltd.	—
Durrans, James, & Sons, Ltd.	20
Dustraction, Ltd.	—
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Engineering Services (Manchester), Ltd.	—
Escol Products, Ltd.	—
Evans, James, & Co., Ltd.	—
Evans, Stanley N., Ltd.	—
Evershed & Vignoles, Ltd.	6
Ewart Chainbelt Co., Ltd.	10&11
Eyre Smelting Co., Ltd.	—
F. & M. Supplies,Ltd.	251
Felco Hoists, Ltd.	—
Fellows & Darby, Ltd.	—
Fischer, George, Ltd.	—
Fisher-Foundries, Ltd.	—
Fletcher Miller, Ltd.	32
Flextol Engineering Co., Ltd.	—
Fordath Engineering Co., Ltd.	5
Foundry Engineering Co. (West Bromwich), Ltd.	The 31
Foundry Equipment, Ltd.	8 & 9
Foundry Mechanisations (Baillot), Ltd.	15
Foundry & Metallurgical Equipment Co. Ltd.	4
Foundry Plant & Machinery, Ltd.	—
Foundry Services, Ltd.	1
Foundry Suppliers, Ltd.	—
Foxboro-Yoxall, Ltd.	12
Franklin Furnaces, Ltd.	53
Fuel & Metallurgical Processes, Ltd.	—
Fullers' Earth Union, Ltd., The	36
G.W.B. Furnaces, Ltd.	—
Gadd, Thos.	—
Gas Council	—
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Hargraves Bros. (Manchester), Ltd.	57
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Jacks, Wm., & Co., Ltd.	45
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Lafarge Aluminous Cement Co., Ltd.	257
Laidlaw, Drew & Co., Ltd.	56
Lazarus, Leopold, Ltd.	—
Leicester Lovell & Co., Ltd.	—
Levy, B., & Co. (Patterns), Ltd.	49
L.M.S. Products, Ltd.	55
Lockheed Precision Products, Ltd.	—
Lones, Joseph Laboratories	—
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Luke & Spencer, Ltd.	40
Macnab & Co., Ltd.	—
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McKechnie Bros., Ltd.	—
Metalectric Furnaces, Ltd.	—
Metalline Cement Co., The	51
Metals & Equipment (Wolverhampton), Ltd.	—
M.G. Plastics, Ltd.	—
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Published by the Proprietors, Industrial Newspapers, Limited, John Adam House, 17/19, John Adam Street, London, W.C.2, and Printed in Great Britain, by Harrison & Sons, Limited, by Appointment to Her Majesty The Queen, Printers, London, Hayes (Middx) and High Wycombe.

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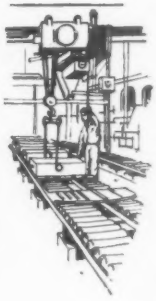

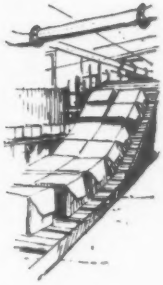

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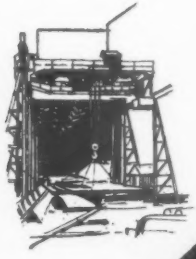

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WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 103
No. 2255
Registered at the G.P.O. as a Newspaper

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